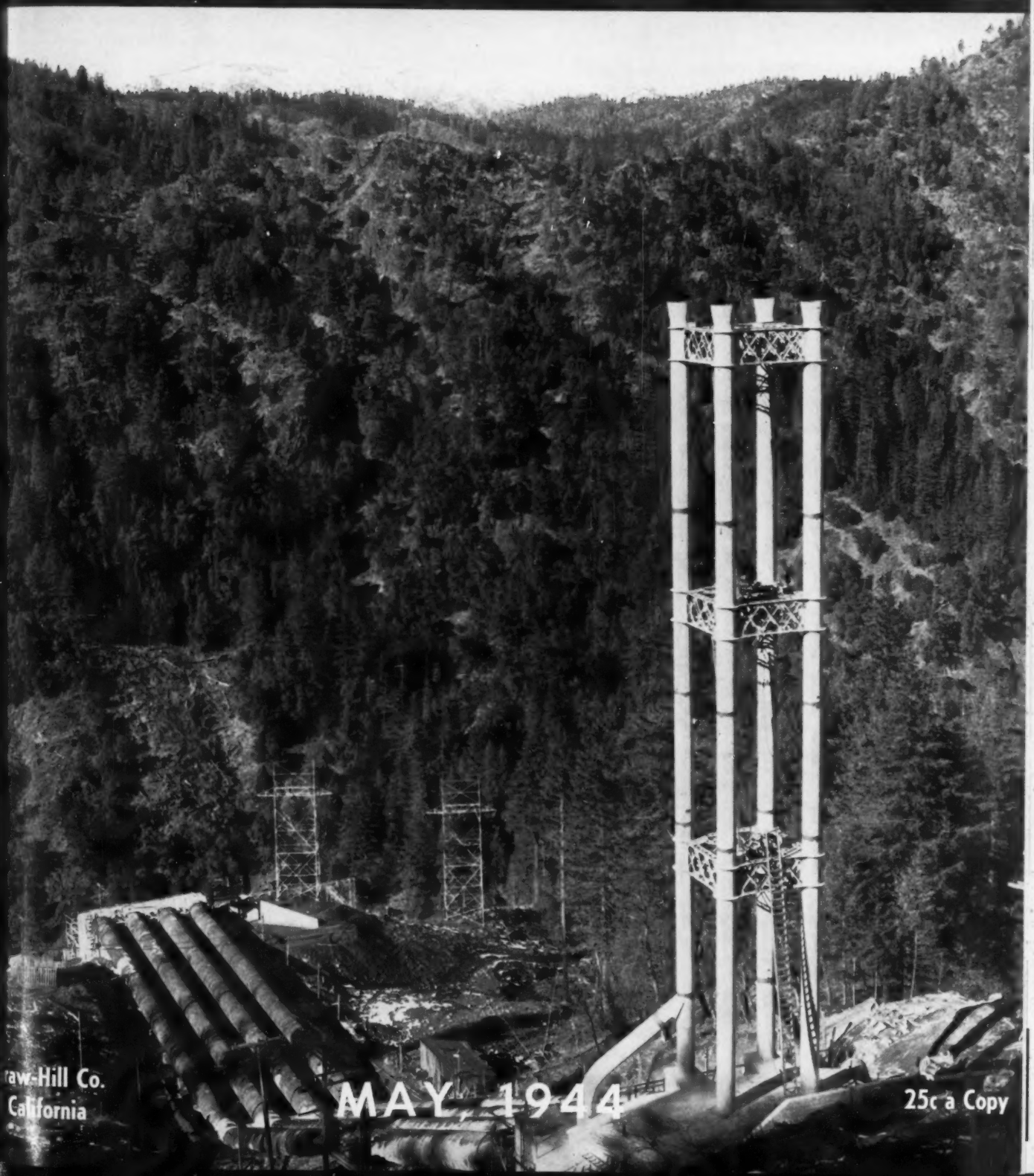
ELECTRICAL WEST



raw-Hill Co.
California

MAY, 1944

25c a Copy

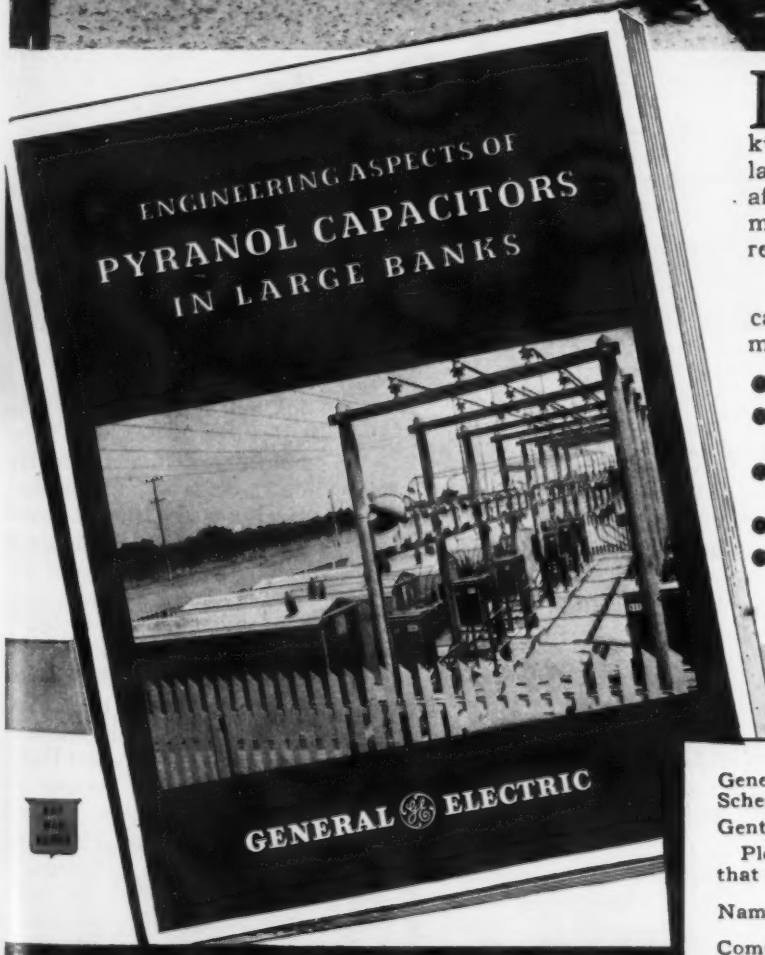
"Going to buy a ranch after the war?"
"Say, neighbor, if you're thinking of living i
that you plan to have your ranch wired for
it is properly wired, I will help you with the
feed, churn, pump water and do lots of othe
will help with the cooking, washing and
electrical comforts and conveniences of the
ready to move out to your ranch, let the Edis
wiring....*there's no charge for this service.*"
CONSERVATION OF ELECTRICITY
SOUTHERN CALIFORNIA EDIS
"Thinking of building a new house?"
"Planning to fix up your yard after the war?"
"Going to have a garage workshop after the war?"
"Lots of fellows I kn
ning to ha
nd they're plan-
You probably
saw, electri-
Adequate Wiring...
KEY TO POSTWAR SELLING

Before the war, the Edison Company helped many of its customers plan the electric wiring systems for their new or remodelled homes. Now, looking forward to the time when new home construction will be resumed, Edison again is offering its services to people who are thinking about postwar building. ● The newspaper advertisements shown here are part of a series currently appearing throughout Edison territory. Reddy Kilowatt—the friendly character who symbolizes Edison electrical service—urges home planners to include adequate wiring in their plans, and to avail themselves of Edison's adequate wiring advisory services. ● This is "postwar planning" with a real future for appliance dealers and others in the electrical industry!

CONSERVATION OF ELECTRICITY WILL HELP WIN THE WAR!

SOUTHERN CALIFORNIA EDISON COMPANY LTD.

ELECTRICAL WEST (with which is consolidated The Journal of Electricity), May, 1944. Vol. 92, No. 5. Published monthly by the McGraw-Hill Company of California, 68 Post Street, San Francisco, 4, Calif. Entered as second class matter at the post office at San Francisco under the Act of March 3, 1879. Additional entry as second class matter at the post office at Los Angeles. Printed in U. S. A. Subscription rate in U. S. and U. S. possessions, and Canada, $2 per year; all other countries $3 gold. Single copy 25c. Copyright, 1944 McGraw-Hill Company of California.



IN the past two years a quarter of a million kva of Pyranol* capacitors has been installed in large banks *near the load*. One power company after another has taken advantage of this simple, material-saving way to supply reactive kva and release system capacity for war loads.

This new booklet contains answers to practically everything you might want to know about making such capacitor installations:

- Reasons for locating kilovar sources near the load
- Economies that can be effected by the use of capacitors
- Relative merits of synchronous condensers and capacitors
- Types of capacitor equipment available
- Application requirements and problems (How to mount, connect, fuse, switch, control, protect from lightning, etc.)

*Reg. U. S. Pat. Off.

GET A COPY OF THIS BOOK
and get started right

General Electric Company, Section C407-74
Schenectady 5, N. Y.

Gentlemen:

Please send me a copy of your booklet (GEA-4225) that tells how to apply Pyranol capacitors in large banks.

Name.....

Company.....

Address.....

City..... State.....

5700

GENERAL ELECTRIC

Here in the WEST

People

John M. O'Dwyer

who writes about No. 14 wire, p. 64, is an Irishman by birth, a Westerner by education. He was graduated from the University of Colorado in 1927. Following that, he spent 7½ years with the California Electric Corp., mainly on hydro maintenance and substation construction and operation, including four years at Boulder Dam. Next came service with the City of Los Angeles, hydro plant operation and four years of construction, operation and maintenance on the Metropolitan Water District aqueduct. He also has done electrical maintenance work for Vega Airplane Corp. and as foreman for Fritz Ziebarth, he installed the main power supply switchboards and control at Basic Magnesium Inc. At present he is employed by the U. S. Bureau of Reclamation as assistant engineer at Boulder Dam. Although he prefers the switchboard to the dafting board, he finally succumbed, he says.

J. P. Jollyman

chief of the division of hydroelectric and transmission engineering of PG and E, who with associates wrote the article on Pit 5 on p. 49 has been identified with hydro and transmission developments of PG and E for more than 40 years. He holds national recognition as a sound forward thinker in high voltage transmission, having many "firsts" and outstanding contributions to his credit. E. F. Maryatt, E. W. Wright and B. D. Dexter, assistant hydro, transmission and substation design engineers respectively, are three of the younger design engineers with Pacific Gas and Electric Co., having to their credit a number of noteworthy projects in recent years. T. J. Corwin, assistant civil engineer, has contributed his part with hydraulic design on many projects.

Pages

Pitt 5 Designed for Simplicity, Economy 49
Largest hydro plant on PG and E system contains simplest and most reliable complement of equipment obtainable for lowest possible operating cost.

Craftsmanship for Kraft Plant 60
Especial care taken in food plant installation to prevent conditions which would harbor the breeding of bacteria.

Inspectors Prepare for New Code 74
Rocky Mountain, Utah and Montana Chapters IAEI group annual meetings to hear about wiring, the Code, sales control.

Sell Our Way Out is RMEL Keynote 78
Denver conference of all industry leagues gives two days of idea swapping and inspiration.

Letters 10
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Lighting and Wiring 60
Sales 68
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News 86

Cover photo: Pacific Gas and Electric Co.'s Pit 5 Project.

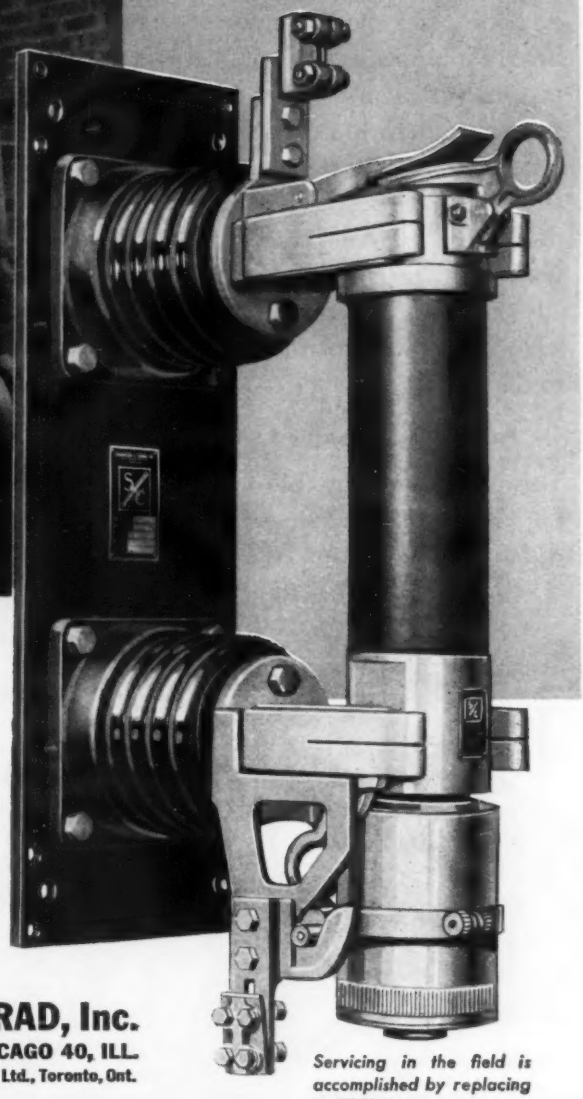
Preview

Convention in Print

Until normal times return, or even until television becomes general, our *Convention in Print*, first instituted in 1932, is the best "alternate" for the old time convention. In some respects it is better, because what the speakers say can be read, reread if necessary, thoroughly digested, and referred to later. All the sessions can be attended and the good derived from each. Only the fellowship and the "bull sessions" are missing and they, of course, are irreplaceable. But with a program such as will appear in the June issue, there is food for thought, unrationed and yet full of points, for everyone. For the *managements* there will be the policy messages of the presidents of three Western associations and a keynote address by one of the most dynamic of the utility chiefs, Frank McLaughlin, president of Puget Sound Power & Light. *Engineers* will find an engineering and operating roundtable discussion from the Northwest association, an analysis of population and load forecasting for future system planning, by J. D. Enefer, Southern California Edison Co., and a paper on rotating equipment modernization by O. A. Gustafson, General Electric Co. The *sales* minded will find a stimulating forecast of postwar electrical uses and markets from D. J. McGonigle, Montana Power. The *contractors, design engineers* and construction readers will be interested in an account of the design of the lighting for Kaiser steel plant, one of the West's potential big industries, written by Robert Dearborn, a creative young illuminating engineer. For *all* there will be full reports of the discussion and significant thought brought forth from the two Pacific Coast Electrical Assn. and the Utilization Section, Northwest Electric Light & Power Assn. conferences being held in the month of May.

SIMPLIFIED PROTECTION

Where High Interrupting Capacity Is Needed • •



● High interrupting capacity S & C Type "SM" Fuses provide dependable power system protection, but require only a small amount of space. They are compact and comparatively light in weight and therefore present no installation problem.

Because they are so easily serviced in a few minutes, unnecessary delays serious to production are avoided.

S & C Type "SM" Power Fuses have short-circuit interrupting ratings up to 1,000,000 KVA in capacities from 1 to 400 amperes, making for wide application both indoor and outdoor for systems up to 33,000 volts.

S & C Fuses afford appreciable savings in initial and maintenance costs.

Simplify your protection problems with S & C Fuses. Write for Bulletin 200-E.

SCHWEITZER & CONRAD, Inc.
4435 RAVENSWOOD AVE. • CHICAGO 40, ILL.
Supplied in Canada through Powerlite Devices, Ltd., Toronto, Ont.

Servicing in the field is accomplished by replacing Refill Unit.

TYPE "SM" POWER FUSES

Experience Will Choose the S & C Fuse

Hotpoint is Pre-selling

. . . with Powerful–Dynamic New Advertising Technique

NOTICE Hotpoint's 1944 national advertising in the magazines shown below. For the first time in electric kitchen advertising, Hotpoint introduces, in its 1944 program, the "cut-away" technique. This is a favorite editorial method of popular national magazines for pictorializing construction details. The "cut-away" gives a visual explanation of the inside of a Hotpoint Electric Kitchen — points reader interest to all kitchen appliances — clearly defines the meaning of a Hotpoint Electric Kitchen. It sells the whole kitchen as a complete unit, rather than the individual appliances. Hotpoint's advertising technique for 1944 shows them "what makes a Hotpoint Electric Kitchen tick." It is adding constantly to the already tremendous interest in Hotpoint.

Following Through on the Bond Wagon Drive

This new advertising follows logically the very successful "Bond Wagon" campaign of the past two years, which featured "Buy War Bonds Today — Electric Kitchens Tomorrow." That campaign did a triple job: 1. Sold War Bonds. 2. Made the public want Hotpoint Electric Kitchens. 3. Provided for payment of those Kitchens with War Bond savings.

Reaching the Mass Market

In all this advertising, the big appeal is to the mass market. Each advertisement stresses that even low-cost homes can afford Hotpoint Electric Kitchens. And remember that these advertisements are talking to both town and farm families right in your community.

With thousands of families saving and planning for Hotpoint Electric Kitchens, the Hotpoint franchise means more today than ever before.

Write for free copy of the beautiful 28-page guide for Kitchen planning—"Your Next Kitchen by Hotpoint."

Edison General Electric Appliance Company, Inc.
5612 West Taylor Street, Chicago 44, Illinois

BETTER CARE LESS REPAIR

More than 90,000,000 Hotpoint messages will be delivered in 1944 by:

For outstanding achievement in War Production

ELECTRIC Hotpoint KITCHEN

REFRIGERATORS · RANGES · WATER HEATERS · WASHERS AND IRONERS · CLOTHES DRYERS · AUTOMATIC DISHWASHERS · ELECTRASINK · STEEL CABINE

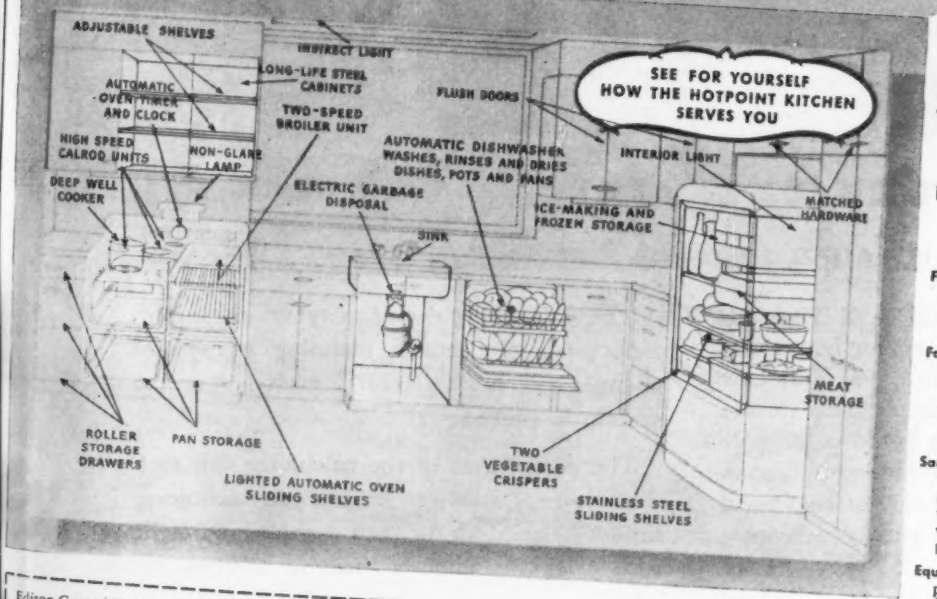
Your Postwar Customers

Your Next Kitchen can LOOK like this...

YES, it's *true!* Your dream kitchen is *almost* a reality. That Hotpoint Electric Kitchen you and Jim have been saving War Bonds for will be priced so reasonably even modest incomes can afford one!

And it's going to be as practical as it is beautiful! For our engineers and designers know how to combine modern utility and modern styling so that *your* new room will be not only a time-saver but a real joy in which to work and *live!*

and Hotpoint *will save you time on All these tasks!*



The cost of a Hotpoint Electric Kitchen averages about 10% of home-building costs.

FOUR MAJOR CENTERS SIMPLIFY WORK IN THE HOTPOINT ELECTRIC KITCHEN

Food Preservation Center—Hotpoint Electric Refrigerator keeps foods fresh longer—provides faster, thriftier freezing and better storage space.

Food Preparation Center—Hotpoint Electric Range, with all utensils stored within arm's length, cooks faster and thriftier. Since there's no combustion dirt, pans, walls stay clean. Automatic controls end cause of cooking failures.

Sanitation Center—Hotpoint Electric Dishwasher, Sink and Disposall wash and dry dishes, pots and pans cleaner than ever without your hands touching water. Food waste is whisked away electrically. Space provided for soap, towels, etc.

Equipment Storage—Electrically lighted Hotpoint Steel Cabinets afford abundant space for dishes, utensils and dry foods.

Edison General Electric Appliance Co., Inc.
5651 West Taylor Street, Chicago 44, Illinois
Enclosed please find ten cents in coin or war stamp for which send me your new kitchen planning guide entitled, "Your Next Kitchen by Hotpoint."

Name_____

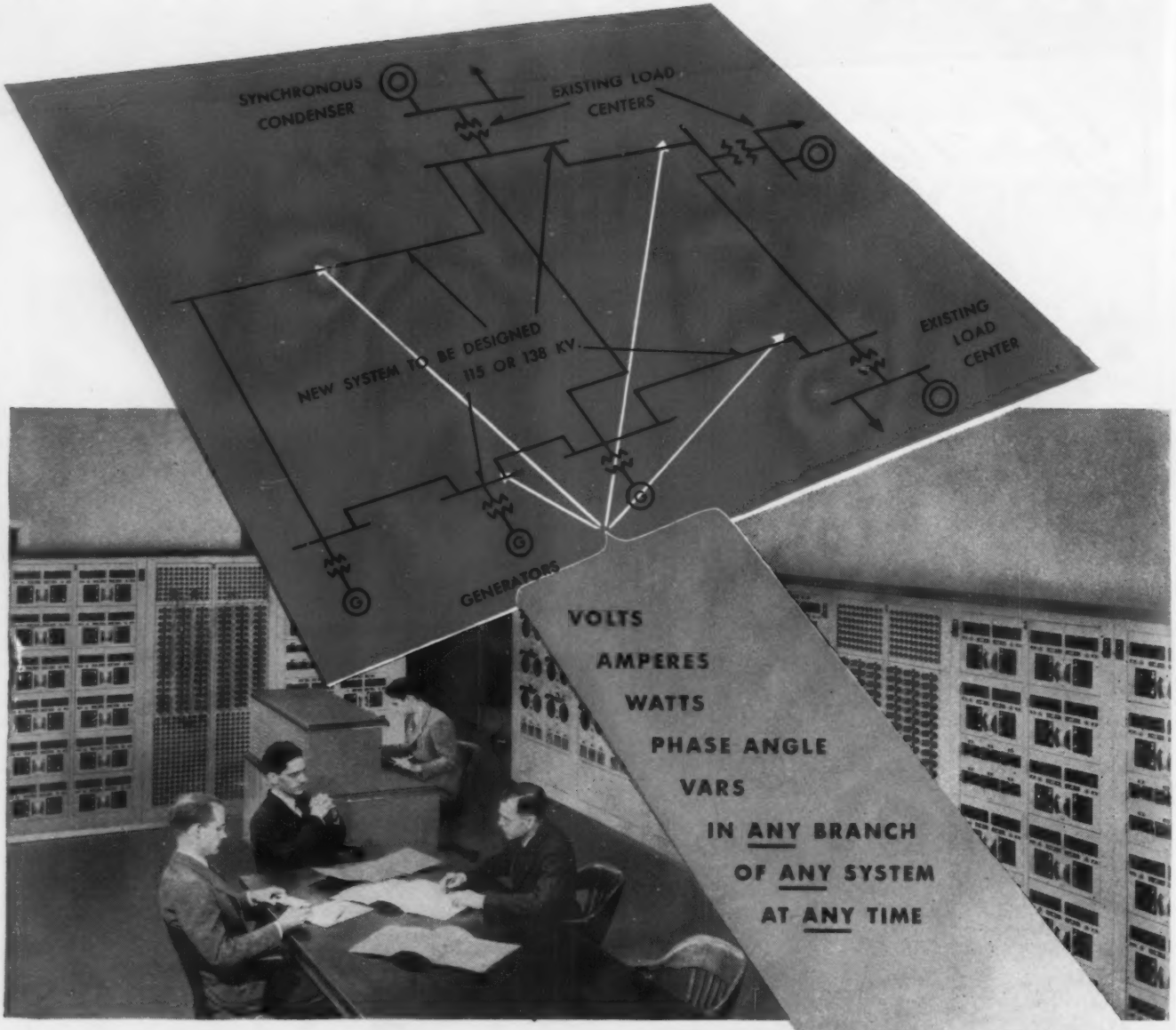
Address_____

City and State_____

Hotpoint ELECTRIC KITCHENS

ARMY E NAVY
FOR EXCELLENCE IN WAR PRODUCTION

This is a reproduction of the first 4-color advertisement in Hotpoint's 1944 national advertising campaign.



NEW A-C NETWORK CALCULATOR "TELLS ALL"

. . . SOLVES TODAY'S OPERATING PROBLEMS . . . PLANS TOMORROW'S CHANGES

Largest and most useful A-C Network Calculator in existence is this new board now in service at East Pittsburgh, Pa. This new calculator incorporates all the advances made since installation of the first board in 1929. It enables setting up 50% more generator circuits and permits simultaneous study of *two* parts of the same system . . . thus greatly increasing speed of operation.

It is saving thousands of man-hours for utilities faced with finding quick answers to problems arising in connection with the utilization of present equipment to its fullest capacity, system stability studies, safe tie-line capacities and similar network problems.

The calculator also is playing an important part in postwar planning of system changes . . . it "*tells all*", even before the system is built.

The advantages of the calculator are such that larger utilities have been acquiring similar calculators for their own use. Of eight such calculators now owned by utilities, six have been built by Westinghouse.

For more information, call your Westinghouse office or write for B-3313. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., Dept. 7-N. J-60547

Westinghouse A-C NETWORK CALCULATOR

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

TRY TRANSITE

IF YOU'RE LOOKING FOR THAT "SOMETHING EXTRA" IN

DUCTS

Check these features which are responsible for the reliable cableway service which Transite Ducts provide:

Inorganic . . . made of an asbestos and cement composition which provides permanen ceand strength, makes the ducts immune to rust or rot.

Permanently smooth bore . . . long cable pulls and replacements are made easier. Danger of damage to cables is minimized.

Easily and quickly installed . . . long, light-weight lengths and simple assembly method assure rapid, economical installation.

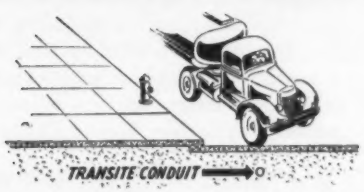
Immune to electrolysis . . . being entirely inorganic and non-metallic, these ducts are not affected by electrolytic or galvanic action.

Lower cable temperatures . . . because of a relatively high rate of heat dissipation.

Incombustible . . . won't contribute to the formation of dangerous smoke, gases, or fumes. If burnouts do occur these inorganic ducts provide maximum protection to adjacent cables and permit easy removal of damaged conductor.

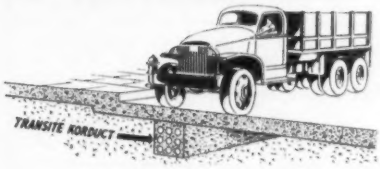
For complete details on Transite Ducts, write for Data Book, DS-410, Johns-Manville, 22 E. 40th Street, New York 16, N. Y.

TRANSITE *CONDUIT*



For exposed work and use underground without a concrete encasement.

TRANSITE *KORDUCT*

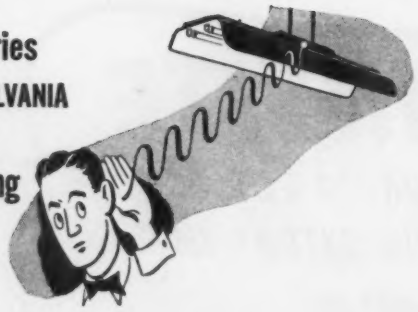


For installation in concrete. Thinner walled but otherwise identical with Transite Conduit.

JOHNS-MANVILLE *TRANSITE DUCTS*

JOHNS-MANVILLE JM PRODUCTS

No. 4 in a series published by SYLVANIA for all users of fluorescent lighting

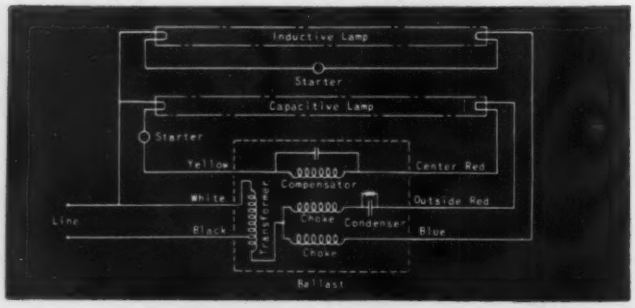


Fluorescent operating hints

BALLASTS

The ballast is a current-limiting device essential to the operation of fluorescent lamps. Without a ballast, the current would rise instantly to a value that would destroy the fluorescent lamp, which is an electrical arc-discharge source.

The ballast consists of an iron-core choke coil and condenser elements embedded in insulating compound. Only the wires necessary for connections with the external circuit are visible. The diagram below shows the internal elements of a ballast and the hook-up in a typical two-lamp circuit.



Ballasts also provide for power-factor correction. A high power factor is essential to lighting efficiency. The table below shows the wattage consumed by both the single and two-lamp types of ballasts.

BALLASTS FOR FLUORESCENT LAMPS

Lamp Size	Line Volts	Approximate Wattage Loss	
		Single Lamp Type	Two-Lamp* Type
6	110-125	2	—
8	110-125	2.8	—
15	110-125	4½	9
20	110-125	4½	9
30	110-125 199-216 220-250	10 9 9	14½ 12 12½
40	110-125 199-216 220-250	13 12 13	17½ 13½ 14½
65	110-125	12	24
100	110-125 199-216 220-250	24 24 24	35 35 35

*Wattage loss is for both lamps.

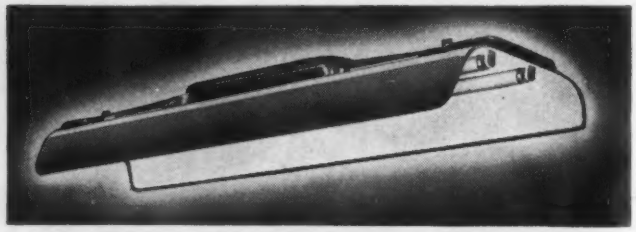
BALLAST SERVICING

Properly designed and installed ballasts last indefinitely under favorable conditions. That is why the ballast is the last thing to check when lamps fail to light. When you are sure that starter and lamp are not at fault, test the ballast by hooking up a bell ringer in series with the coils. If bell fails to ring, you know that ballast is defective.

Don't Try to Repair a Bad Ballast. Replace it with a new one. Then there will be no risk to your investment in fluorescent equipment.

A hum that grows in severity is a sure sign of impending ballast trouble.

Improper ballast equipment can cause lamps to blink with a definite "on" and "off" period and thereby shorten lamp life. Be sure to use the right ballast replacement, as specified by the manufacturer of your particular fixtures.



THE BALLASTS ARE RIGHT IN SYLVANIA "PACKAGES OF LIGHT"

Sylvania sells industrial and commercial fixtures complete with lamps, ballasts, sockets, starters — wired and ready for immediate installation. The ballasts in every Sylvania fixture are made to the same high quality standards as Sylvania lamps, starters, reflectors and sockets.

For Additional Maintenance Information
Send For This Free Booklet

SYLVANIA ELECTRIC PRODUCTS INC.

"Fluorescent at its Finest"

595 So. Flower St. Los Angeles 13, Calif.
111 Sutter St. San Francisco, Calif.
468 White-Henry-Stewart Bldg. Seattle 1, Wash.

FLUORESCENT LAMPS, FIXTURES AND ACCESSORIES, INCANDESCENT LAMPS, RADIO TUBES, CATHODE RAY TUBES, ELECTRONIC DEVICES

Tests to determine the faithfulness to specification of a given station insulator can be conducted in half an hour--all you really *know* about that insulator can be discovered in the first half-hour of its life. Yet, the most important thing of all is how long the insulator will stay in service, but no kind of testing will reveal this vital information to you...True, all reputable station insulators have the same physical characteristics; all adhere to rigid published specifications; all are alike--*for the first half-hour!*..Not in the first half-hour, but the first half-minute, you can discover the most important thing to know about a station insulator--that it was made by O-B. Long, trouble-free insulator performance can't be specified or predicted. You buy these qualities "on faith"; and the longest service records in the industry justify this faith when you specify O-B.

Ohio Brass

MANSFIELD, OHIO

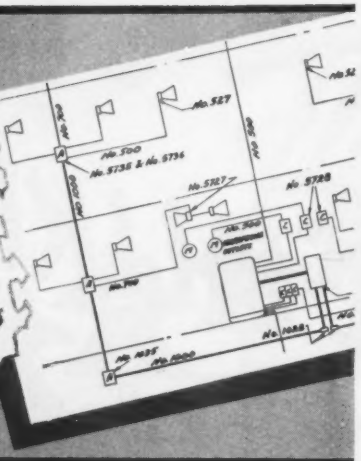
CANADIAN OHIO BRASS COMPANY, LTD.,
NIAGARA FALLS, ONTARIO

2469-H

★ *KEEP BUYING WAR BONDS* ★

the problem

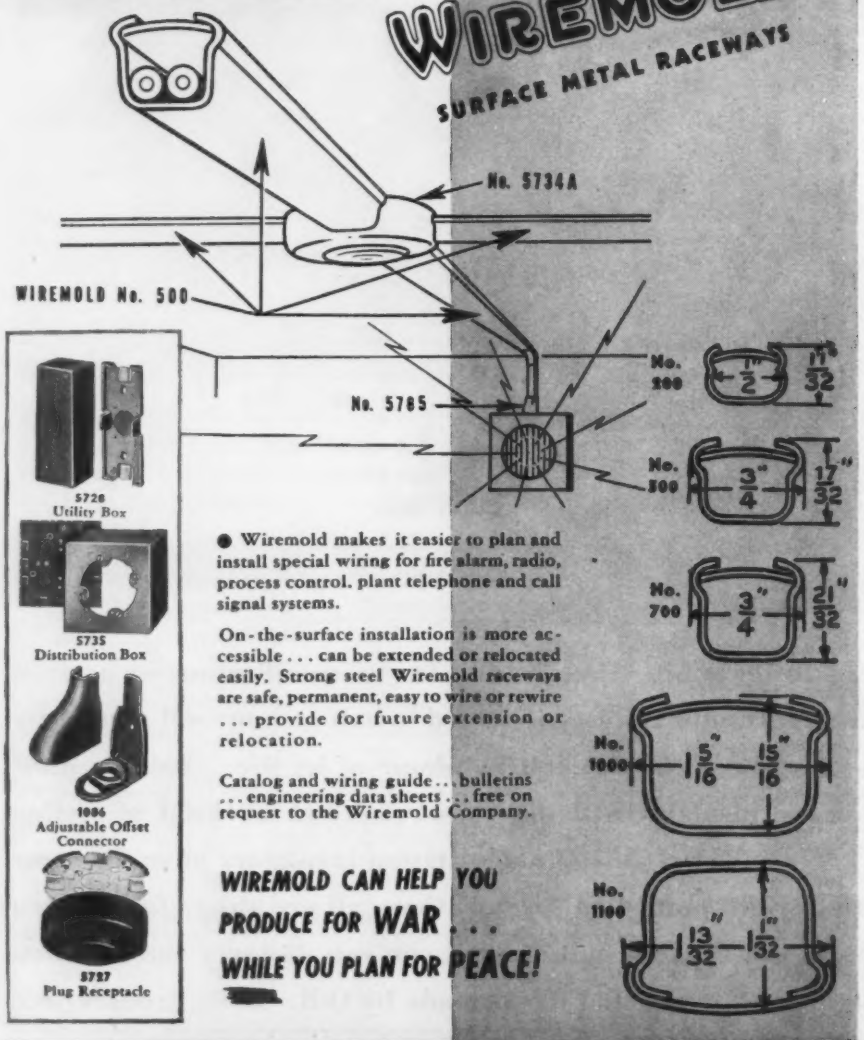
Signal System Wiring for factories, offices, laboratories, and service buildings



the answer

WIREMOLD

SURFACE METAL RACEWAYS



● Wiremold makes it easier to plan and install special wiring for fire alarm, radio, process control, plant telephone and call signal systems.

On-the-surface installation is more accessible . . . can be extended or relocated easily. Strong steel Wiremold raceways are safe, permanent, easy to wire or rewire . . . provide for future extension or relocation.

Catalog and wiring guide . . . bulletins . . . engineering data sheets . . . free on request to the Wiremold Company.

WIREMOLD CAN HELP YOU PRODUCE FOR WAR . . . WHILE YOU PLAN FOR PEACE!

KNOW YOUR

WIREMOLD

AND YOU KNOW THE ANSWERS

THE WIREMOLD COMPANY HARTFORD 10, CONN.

LETTERS

to the editor

To the Editor:

My attention has been called to an error in my article, *A-C Welders in Construction and Operation, Part I*, in the ELECTRICAL WEST for December 1943, and I felt the matter should be referred to you in case it has been questioned by any of your readers. On page 54, third column, under the heading, "A-C Welding," the second sentence which reads in part, "the series impedance which is usually *resistance*," should read, "the series impedance which is usually *reactance*." Because of the difference in characteristics, the distinction between the use of resistance and reactance is rather important. In other parts of the write-up, the advantages of reactance and reasons for its general use are emphasized.

V. B. Wilfley
Engineering & Service Division,
Westinghouse Electric & Mfg. Co.
St. Louis, Mo.

ELECTRICAL WEST regrets this error, made in copying Mr. Wilfley's original article.

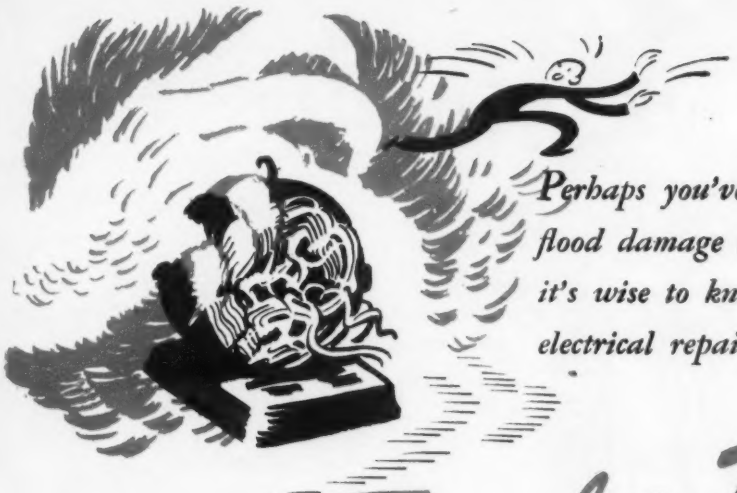
BOOKS

you may want

ELECTRIC CIRCUITS AND FIELDS, by Harold Pender and S. Reid Warren, Jr., 534 pages, 6x8, McGraw-Hill Co., $4. The outstanding feature of this book is an approach to electric circuits and fields from a point of view preparatory to both power and communications engineering. Electric circuit theory is developed in a thoroughgoing manner covering direct, alternating and polyphase current circuits. Simple transient phenomena are treated briefly. Filters and transmission lines are treated in a manner which will be helpful to the power engineer who desires a better understanding of widely used communications circuit elements. Although symmetrical components are discussed briefly, the reader should refer to some of the references listed for a real introduction to this powerful tool in circuit analysis. Electronic tube circuits, as an example of a non-linear circuit, are treated with particular reference to series analysis of periodic currents.

The subject of electric fields, both electrostatic and magnetic, is discussed at length in the second half of the book. The development of vector analysis as applied to a study of these fields is valuable for its adequate yet not too involved analysis.

This work is intended primarily as an introductory text for electrical engineering students. Material presented will serve as background for subsequent studies in either power or radio engineering. It is this viewpoint, partly of the power engineer, partly the communications man, that will appeal to those who wish to "brush-up" on fundamentals widely used in either power or communications.—W.R.J.



Perhaps you've never been faced by serious fire or flood damage in your plant. But you may be—and it's wise to know where to call for prompt, efficient electrical repair service.

Fire? Flood? Phone us . . .

FOR ELECTRICAL REPAIRS

Westinghouse District *Manufacturing and Repair** Plants have had years of experience in handling equipment damaged by fire and flood. Employees with long service records, and thorough knowledge of how to handle and treat such apparatus, are ready to go on the job at once.

In special emergencies M & R Plants draw experienced personnel from other districts or even from Westinghouse headquarters, to help restore apparatus to normal in the shortest possible time.

This is just one phase of Westinghouse M & R service—a nationwide organization of completely equipped repair plants ready to give you prompt, dependable service on any type of electrical equipment.

J-90519

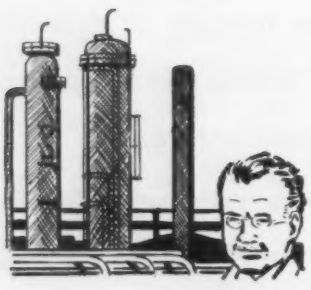
When vital electrical equipment needs repair . . . phone the nearest office of Westinghouse Electric and Manufacturing Company for

Westinghouse

COMPLETE REPAIR SERVICE

***33 M & R PLANTS • • ONE NEAR YOU**

How to pick a *good* turbine oil!



Despite packing glands and stuffing boxes, turbine oils are bound to get water or steam in them from time to time. This being the case, you want to be sure you're buying an oil that is stable, and demulsifies readily.

One of the biggest factors in turbine oil stability is the degree to which the oil has been refined. If it has been given a "short-cut" processing, it will break down quickly—form sludge and corrosive acids.

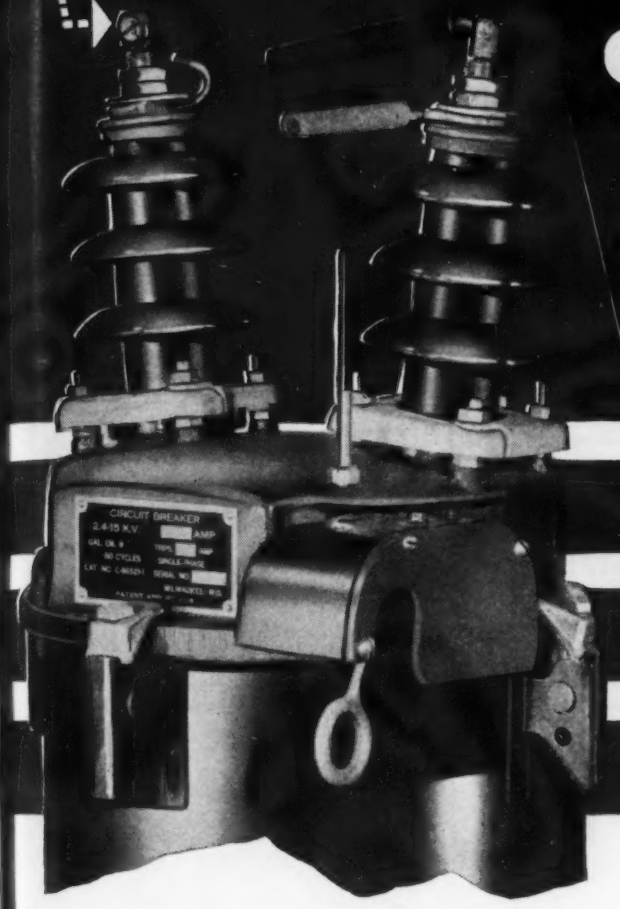
Unacal Turbine Oil is processed in special refining equipment to the point where it is just about as stable as an oil *can* be. Consequently, it is tough, won't break down, stays on the job, protecting high-speed bearings and moving parts against wear.

Try Unacal Turbine Oil...You can get a supply right away by simply calling your Union Oil Resident Manager. Unacal Turbine Oil comes in four viscosity grades... one of which will do *your* particular job exactly right!

UNACAL TURBINE OIL

Another
UNION OIL
Success-Tested Product

KYLE
Oil Circuit Breaker is
Triple Safe



Normal Position of the Breaker is Open··

Operating Handle and Tank Always Dead··

No Terminal in Bottom of Tank··

Why Kyle Oil Circuit Breaker Affords Maximum Line Protection

It is the only circuit breaker with positive dependable hydraulic timing.

•

It has high interrupting capacity and will not fail in protecting the line. It is electrically and mechanically sound.

•

It is so designed that each opening is fast and each closing requires an interval of three seconds. Most faults are cleared automatically on the first opening.

•

It will reset itself for a complete cycle of operations up to lock-out on the fourth operation in a series.

•

Ratings: Volts 2300 to 15,000. Amperes: 3 to 50. Minimum Tripping Current: 8 to 102 amperes. Interrupting Rating: 120 to 2000 amperes. Weight 135 pounds with oil.

The Kyle Oil Circuit Breaker is so designed that it not only protects the lineman, but also protects itself, and thereby affords the greatest protection to your lines and service.

The terminals located at the top of the breaker bushings are the only exposed live parts of the Kyle Oil Circuit Breaker. The normal position of the breaker is open which assures that a locked out breaker is harmless to life and property.

The breaker cover is "dead," the tank is "dead," the operating handle is "dead." These features make for easy pole mounting without danger to linemen.

The thermal trip device within the breaker prevents burning up due to overloads by locking out the breaker when a temperature of approximately 200° F. is reached.

The breaker is protected from lightning by external flash-over gaps so that no electrical stresses are imparted to the breaker by lightning surges.

All parts of the Kyle Oil Circuit Breaker are completely sealed from exposure to the elements.

KYLE CORPORATION

SOUTH MILWAUKEE, WISCONSIN

Kyle Oil Circuit Breakers are sold exclusively through all brands offices

of the LINE MATERIAL COMPANY Milwaukee, Wisconsin

T&B QUICK GUIDE FOR MAINTENANCE AND REPAIR WIRING JOBS

Hooking Them Up The T&B Pressure (Solderless) Way

The Lock-Tite Way to button up wiring is simplicity itself.

A glance at the guide, pictures your individual wiring requirements and identifies the correct Lock-Tite Connector for the job.

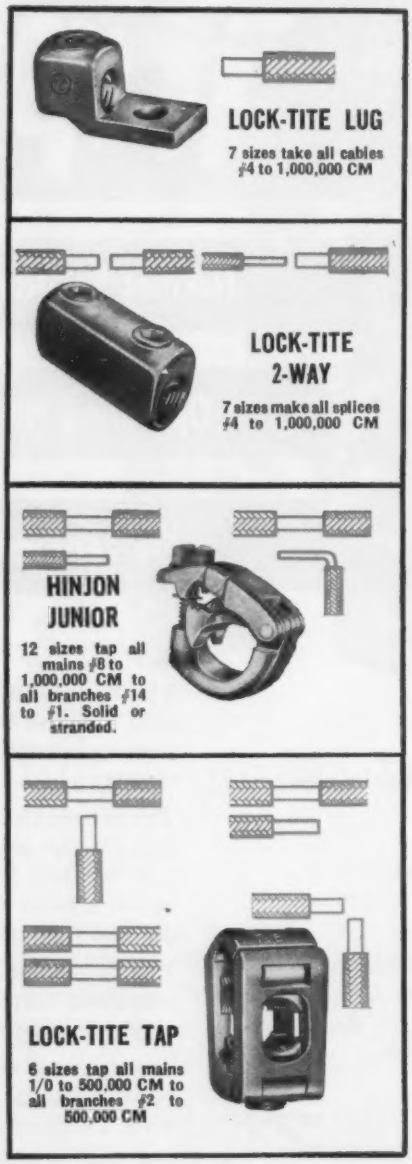
Each Lock-Tite fitting is so versatile that it takes a wide range of overlapping cable sizes, and thereby saves stocking a miscellaneous assortment of seldom used pieces.

They are engineered to take solid, stranded, flexible, extra flexible, hemp-core, rod or tubing.

All Lock-Tite Connectors are one piece construction with no loose parts. A positive locking disc assures reliable performance under continuous severe vibration. Being solderless, they are a perfect cinch to install with key wrench or screw driver. Fully salvageable. Approved by Underwriters Laboratories.

The Lock-Tite way of wiring helps the maintenance and repair man to put the juice back on, and keep it on.

For prompt delivery, order the Lock-Tite Connectors from the stock of your local T&B Wholesaler. We distribute exclusively through his competent service organizations.


LOCK-TITE LUG
7 sizes take all cables #4 to 1,000,000 CM
LOCK-TITE 2-WAY
7 sizes make all splices #4 to 1,000,000 CM
HINJON JUNIOR
12 sizes tap all mains #8 to 1,000,000 CM to all branches #14 to #1. Solid or stranded.
LOCK-TITE TAP
6 sizes tap all mains 1/0 to 500,000 CM to all branches #2 to 500,000 CM

For complete Lock-Tite Maintenance and Repair Bulletin, Contact your T&B Distributor or write nearest T&B Office.

The Thomas & Betts Co., Inc.,
103 N. Santa Fe Avenue,
Los Angeles, 12, Calif.

The Thomas & Betts Co., Inc.,
542 Natoma Street,
San Francisco, California.

Paul A. Douden & Co.
1645 Wazee Street,
Denver, 2, Colorado.

F. A. Strohecker,
301 Eyres Bldg.,
2207 First Ave., S.,
Seattle, 4, Washington.

THE THOMAS & BETTS CO.
INCORPORATED
MANUFACTURERS OF ELECTRICAL FITTINGS SINCE 1899
ELIZABETH 1, NEW JERSEY
In Canada: Thomas & Betts Ltd. Montreal

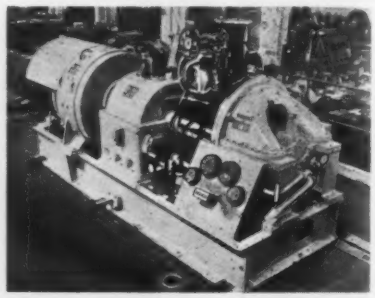
E Flag awarded April, 1943
White Star awarded October, 1943

PRODUCTS *that are news*

Turbo-Generator (500)

A turbo-generator, built to meet requirements of the Navy and Maritime Commission, has been announced by the Joshua Hendy Iron Works. Basic design of the new unit covers a wide range of output, starting at 250 kw., it is stated in the announcement, and the modern trend toward simplification has been followed throughout.

Backbone of the turbine is the large-diameter spindle with disks having large hub sections, assuring greater strength. In-



terstage seals are of the step-cut labyrinth type. The steel Rateau nozzle disks have welded-in, rolled stainless-steel nozzle blades and spacers. The governing system uses anti-friction bearings and is without stuffing boxes or soft packings, according to the manufacturer.

The reduction gear case is of fabricated steel, and external piping has been reduced to a minimum, it is stated. The generator field yoke is formed of rolled steel plate, split on the horizontal centerline with the halves bolted together. The shaft bearing is of the sleeve type, mounted in a self-aligning spherical seat.

Conductive Rubber (501)

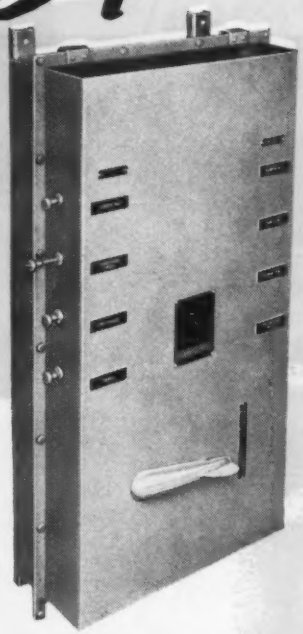
United States Rubber Co. has developed a synthetic rubber composition which acts as an electricity conductor rather than as an insulant. When impregnated into cotton fabric and attached to electric currents, it is said to become an efficient heating pad. Wartime applications are for machine guns and aerial cannons to prevent jamming in extremely cold temperatures and on airplane propeller blades to prevent ice formation. Possible peacetime applications include house heating units in the form of decorative wall panels, according to company engineers. The conductive rubber was devised while searching for a way to eliminate sparks and static electricity in munitions plants.

Electron Microscopes (502)

General Electric has a small number of simplified electron microscopes for shipment on high priority to industrial laboratories and colleges. The new instruments are essentially the same as the war model previously demonstrated but are housed in a desk design for convenience of operation. They operate on ordinary house current and are capable of producing images 10,000 times the size of the specimen. They are said to be approximately ten times more powerful than the best light microscope.

SQUARE D PANELBOARDS

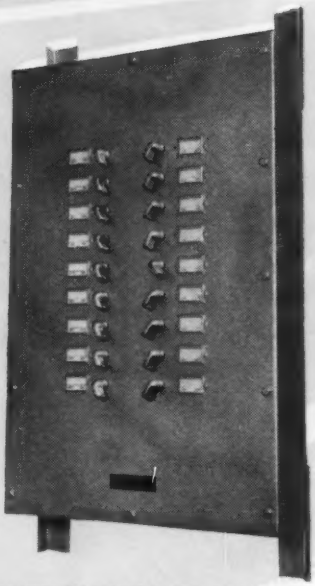
WITH *Special Purpose* ENCLOSURES



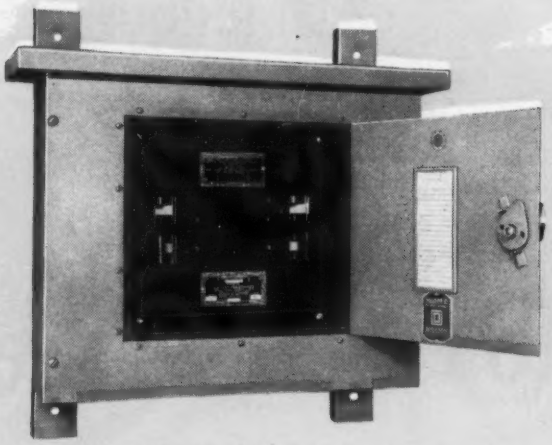
WATER-RESISTING ENCLOSURE with externally operated circuit breakers. Side-operated plunger handles reduce depth dimensions.

WITH BRANCH CIRCUITS OF
15 TO 600 AMPERES
115 TO 600 VOLTS A.C.
125 to 250 VOLTS D. C.

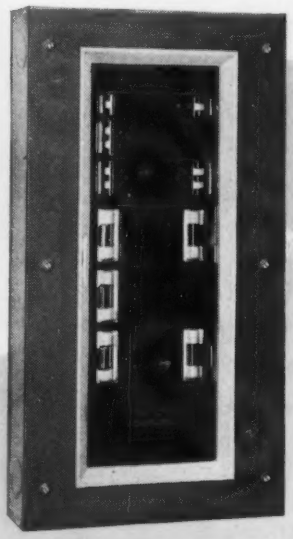
• These are only a few of the many types of special enclosures built by Square D. Regardless of your particular requirements, the nearest Square D Field Engineer can meet them. You'll find him a source of sound counsel in determining the best type of equipment for any given application.



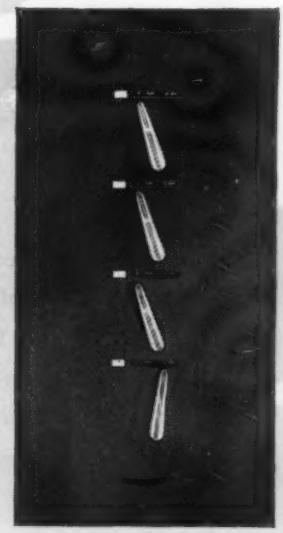
DUST-TIGHT AND VAPOR-PROOF ENCLOSURE with externally operated circuit breakers Rotary type handles on front are easy operating and self-indicating



WEATHERPROOF ENCLOSURE for all types of panels, both fusible and circuit breaker. Top is extended and flat instead of sloped, thus facilitating conduit entrance.



DUST-RESISTING ENCLOSURE for fusible or circuit breaker panels. Handles are recessed as safeguard against breakage.



DUST-TIGHT AND VAPOR-PROOF ENCLOSURE with lever-type handles for easy operation of high capacity breakers.

ELECTRICAL EQUIPMENT • KOLLSMAN AIRCRAFT INSTRUMENTS

SQUARE D COMPANY

LOS ANGELES • DETROIT • MILWAUKEE

YOUR TWO BEST BETS ON ALL INSULATING PROBLEMS

Your Westinghouse distributor offers two quick solutions to your electrical insulating problems.

First: The complete Westinghouse line of "Tuffernell" Insulating Materials—proved by 50 years of field tests with every type of electrical equipment.

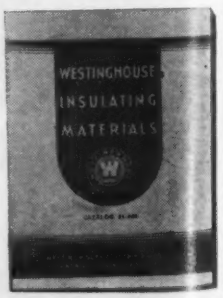
Second: The distributor's own "how-to-do-it" ability representing knowledge drawn from Westinghouse insulating headquarters and experience gained in similar applications for countless other customers.

Your Westinghouse distributor stocks a line of insulating materials that's really complete . . . from varnishes and cements to fabrics and tapes. And every material is "Tuffernell"—exactly what you need in flexibility, dielectric and mechanical strength.

J-90509

GET THIS NEW CATALOG

To simplify selection of the right insulation—your Westinghouse distributor now has available the new Westinghouse "Insulating Material Catalog". It contains listings of micas, fabrics, tapes and papers, along with complete dimensions, ratings and other helpful application data. Ask today for your copy of Catalog 65-000. Or, write Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., Dept. 7-N.



Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

SEE YOUR WESTINGHOUSE DISTRIBUTOR *FIRST!*

CENTRAL RIGID STEEL CONDUIT

Installed in 1931 and still doing a good job

North Corridor of Filter Building
City of Detroit, Department of Water Supply
Spring Wells Station

Control House during construction, August, 1931

"There's Tested Strength in Every Length"

SPANG-CHALFANT

Division of The National Supply Company

Executive Offices: Grant Building, Pittsburgh, Pa.

District Offices and Sales Representatives in Principal Cities

Electrification calls for KLEINS

BACK from service, experienced linemen and electricians will find jobs waiting for them. Right now, power, communication and transportation companies are making plans to extend essential service to a postwar America.

When that time comes, Klein tools and equipment will be back on the job, protecting the man on the pole—helping him to get his work done.

Today, when Klein production is largely needed to meet war demands, linemen and public utility companies are finding that the extra quality—the extra service they receive from the Klein equipment they purchased before the war is serving them in good stead.

The Klein line of tomorrow will have the same extra quality, the same extra service that has been a part of all equipment carrying the name Klein "since 1857."

ASK YOUR SUPPLIER

Foreign Distributor:
International Standard Electric Corp.
New York

This book on the care and safe use of tools will be sent without charge on request.

Mathias KLEIN & Sons
Established 1857 Chicago, Ill., U.S.A.
3200 BELMONT AVENUE, CHICAGO 18, ILLINOIS

Snap-Action Relay (503)

Design simplification of its snap-action relay, fitting it for general use, was announced recently by Struthers-Dunn, Inc. The relay was first introduced in the higher-price field as an overload unit for protecting an electron microscope, according to the manufacturer. The unit is so designed that its armature practically completes its travel before the contacts snap with a positive action to the corresponding position, it is stated.

Normal sensitivity is 0.01 watt, although it is stated that a greater degree of sensitivity may be secured by means of various circuit arrangements. Contact arrangement is S.P.D.T. and contact rating is 10 amp., 110 volts a-c and 10 amp., 24 volts d-c. Balanced construction is said to withstand 10 g. vibration and shock. Coil resistance available from ¼ to approximately 30,000 ohms. Weight is 10 oz.; size 2¾ x 3 x 1¾ in.

Resilient Mounting (504)

A new type resilient mounting utilizing rubber or rubber-like materials has been patented by a B. F. Goodrich Co. engineer and assigned to the company. Mountings covered by this invention have cylinders of rubber or rubber-like materials interconnected by arms in S-fashion, an arrangement which is said to permit an extremely soft suspension under light load and to allow the resilient material freedom of movement in all directions.

According to the manufacturer, the invention is valuable in a variety of applications, including mounting of flexible power transmission couplings, motors for musical instruments and housings for aircraft compasses and other instruments.

Glass Ring Jewels (505)

Developed for aircraft instrument bearings, glass ring jewels are now available for other applications, according to General Electric Co. These jewels are listed in five sizes for use in precision measuring equipment, and other shapes and sizes are possible for thread guides, weighting scales, automobile and truck speedometers and similar applications. The ring jewels are said to be superior to sapphire in many respects and are approximately one-third the cost. They are supplied ready to set at $120 per 1,000, according to the announcement.

Seamless Tape (506)

A seamless bias alternate for varnished silk has been developed by the Irvington Varnish and Insulator Co. The new material is obtainable in continuous length rolls of 36 or 72 yd. Elimination of seams or splices is said to permit uniformly tight, compact taping, This product is available in either a slightly tacky or mica dusted finish. Dielectric strength is reported to be 1,200 vpm. and tensile strength 42 lb. per 1-in. width.

Temperature Control (507)

An electric temperature control with manual reset over-heating cut-off feature is offered by Robertshaw Thermostat Co. The device consists of a standard Model D 1 double-pole, single-throw electric temperature control, equipped with an auxiliary single-pole single-throw switch, which automatically cuts off all current as soon as operating temperature is exceeded by 30° F in liquid or 50° F in air.

STEP UP

...Motor and Lighting Performance!

THAT BANK of three Allis-Chalmers Dry-Type Transformers, below, assures *better* voltage regulation, *lower* line losses in a large west coast shipyard.

The units are installed *right next to* the equipment they serve, yet they're up . . . *out of the way.* A long run of heavy secondary copper was saved. Man-hours and money were saved . . . because fireproof vaults weren't needed. There is no insulating liquid to test, filter or change . . . saving on maintenance. And because these drip-free units go up anywhere — on posts, beams, platforms, etc. — valuable floor space is saved!

Allis-Chalmers Dry-Type Transformers are ready for quick shipment *now.* For details, see our nearby district office. Or write, ALLIS-CHALMERS, MILWAUKEE 1, WISCONSIN.

A 1692

These Units Ready for Quick Shipment—Now!

CHECK THESE TRANSFORMER FEATURES:

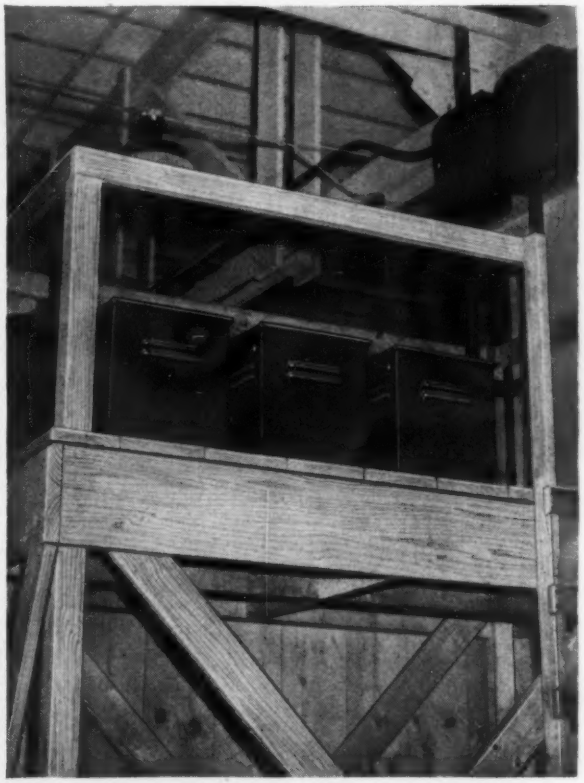
Smaller, Adaptable Size — permitting quick, easy changeover.

Easy-To-Get-At connections and knockouts; fast installation.

Windings Separated by solid insulation — meet safety requirements for inside buildings.

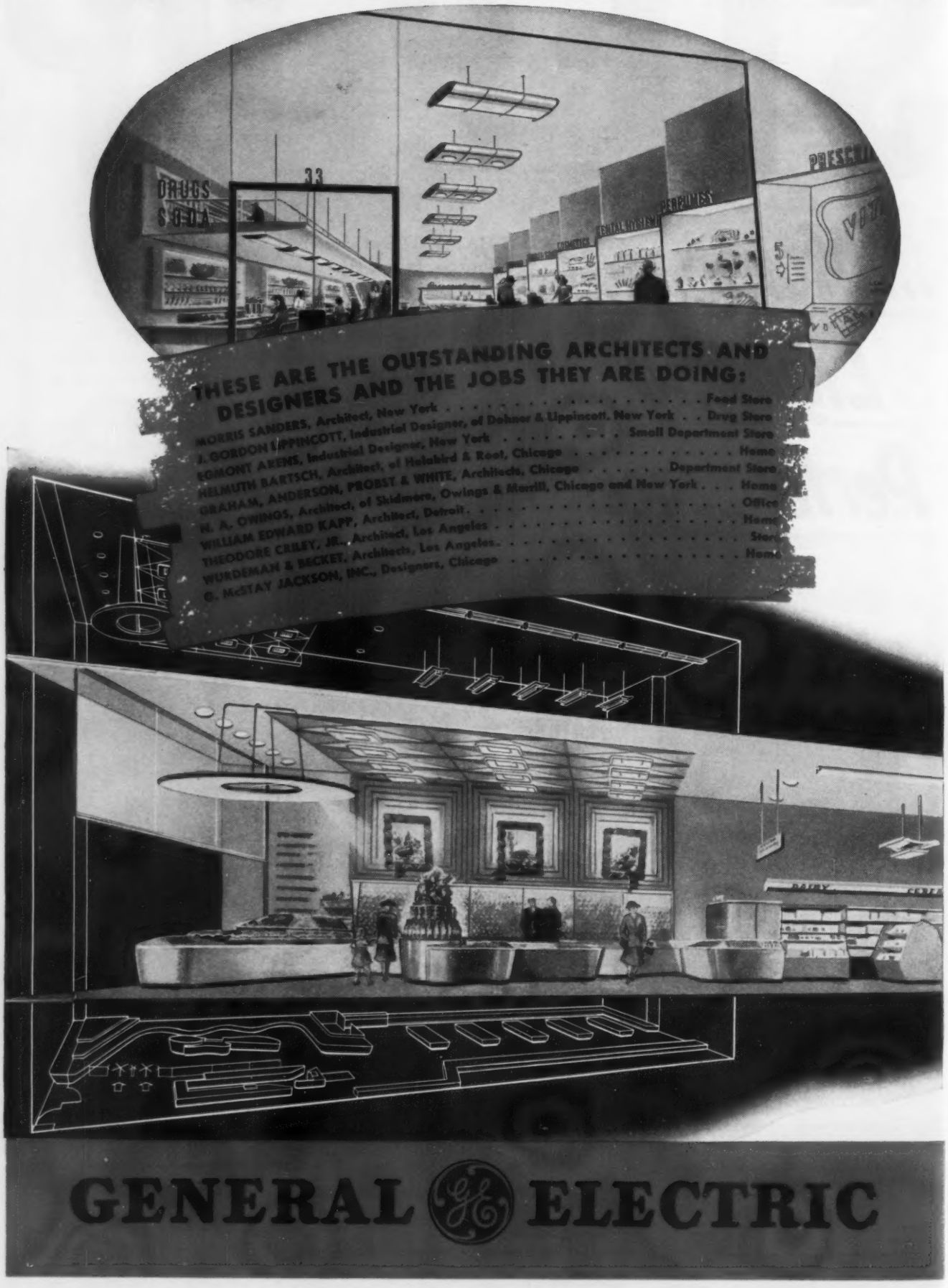
Coils Heavily Impregnated — rendering windings resistant to moisture.

Wide Range of Sizes — 1½ to 500 kva, single and 3-phase, with incoming voltages up to 15,000 v.



ALLIS-CHALMERS DRY TYPE TRANSFORMERS

G-E PAVES THE WAY FOR


DRUGS
SODA
33
PRESCR
VOTE
THESE ARE THE OUTSTANDING ARCHITECTS AND DESIGNERS AND THE JOBS THEY ARE DOING:
MORRIS SANDERS, Architect, New York . . . . . Food Store
J. GORDON LIPPINCOTT, Industrial Designer, of Dohner & Lippincott, New York . . Drug Store
EGMONT ARENS, Industrial Designer, New York . . . . . Small Department Store
HELMUTH BARTSCH, Architect, of Holabird & Root, Chicago . . . . . Home
GRAHAM, ANDERSON, PROBST & WHITE, Architects, Chicago . . . . . Department Store
N. A. OWINGS, Architect, of Skidmore, Owings & Merrill, Chicago and New York . . . . Home
WILLIAM EDWARD KAPP, Architect, Detroit . . . . . Office
THEODORE CRILEY, JR., Architect, Los Angeles . . . . . Home
WURDEMAN & BECKET, Architects, Los Angeles . . . . . Store
G. McSTAY JACKSON, INC., Designers, Chicago . . . . . Home
DAIRY

GENERAL ELECTRIC

POSTWAR LIGHTING PROGRESS!

GENERAL ELECTRIC BRINGS TO THE LIGHTING INDUSTRY THE CREATIVE IDEAS OF FAMOUS ARCHITECTS AND DESIGNERS FOR BETTER COMMERCIAL AND RESIDENTIAL LIGHTING

THE postwar store, office and home offer the greatest opportunities for lighting progress in the history of the lighting industry. About 1,500,000 commercial establishments and some 600,000,000 sq. ft. of office space will be ready for better lighting; about 10,000,000 new homes will be needed to bring housing demand into balance with supply in the decade after the war.

To supply these markets with the kind of lighting that sets new standards of comfort and attraction will require development of new and improved lighting techniques. General Electric now offers the lighting industry a comprehensive program to stimulate this development.

G-E Enlists Outstanding Talent

Ten famous architects and designers have been retained by G-E to work out creative ideas for better lighting. Their assignments will cover small and medium-size stores, offices, and low and medium-price homes.

Their plans and suggestions will be made available:

1. To other architects, so that new lighting tools and techniques will become familiar to the entire architectural profession.

2. To fixture manufacturers, so that they may develop lighting units that are acceptable to architects and designers and at the same time efficient and easy to make.

3. To distributors, contractors and lighting companies.

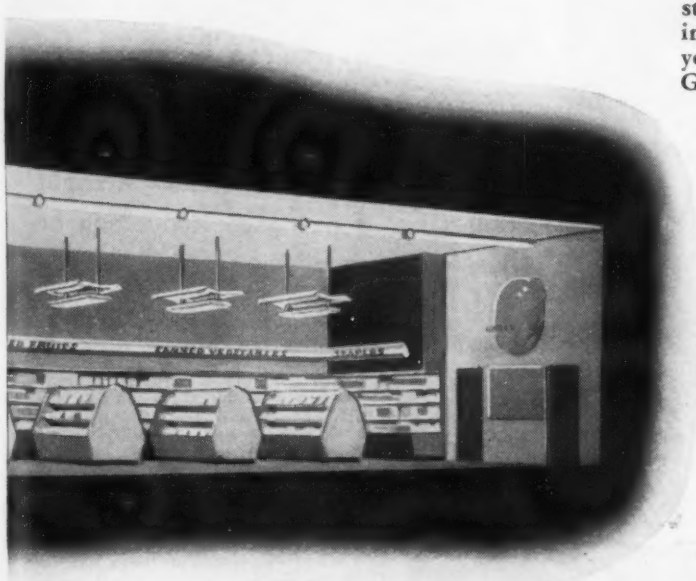
4. To the potential buyers of better lighting, so they may have a wider appreciation of modern lighting practice.

To Promote Lighting Progress

We believe this new G-E program will help the lighting industry give the postwar buyer the benefit of the best planning, the best thinking, and the most effective lighting the industry can provide.

Suggestions for lighting the food store shown at left are described in a new booklet now ready. For your free copy, write Dept. 166EW-E, General Electric, Nela Park, Cleveland 12, Ohio.

A comprehensive G-E advertising program *will bring the work of these outstanding men to all interested groups. An advertisement featuring the food store, for example, appears in the April issues of Architectural Forum, Architectural Record, New Pencil Points, Chain Store Age (Adm.), Progressive Grocer, National Grocers Bulletin and Super Market Merchandising.*

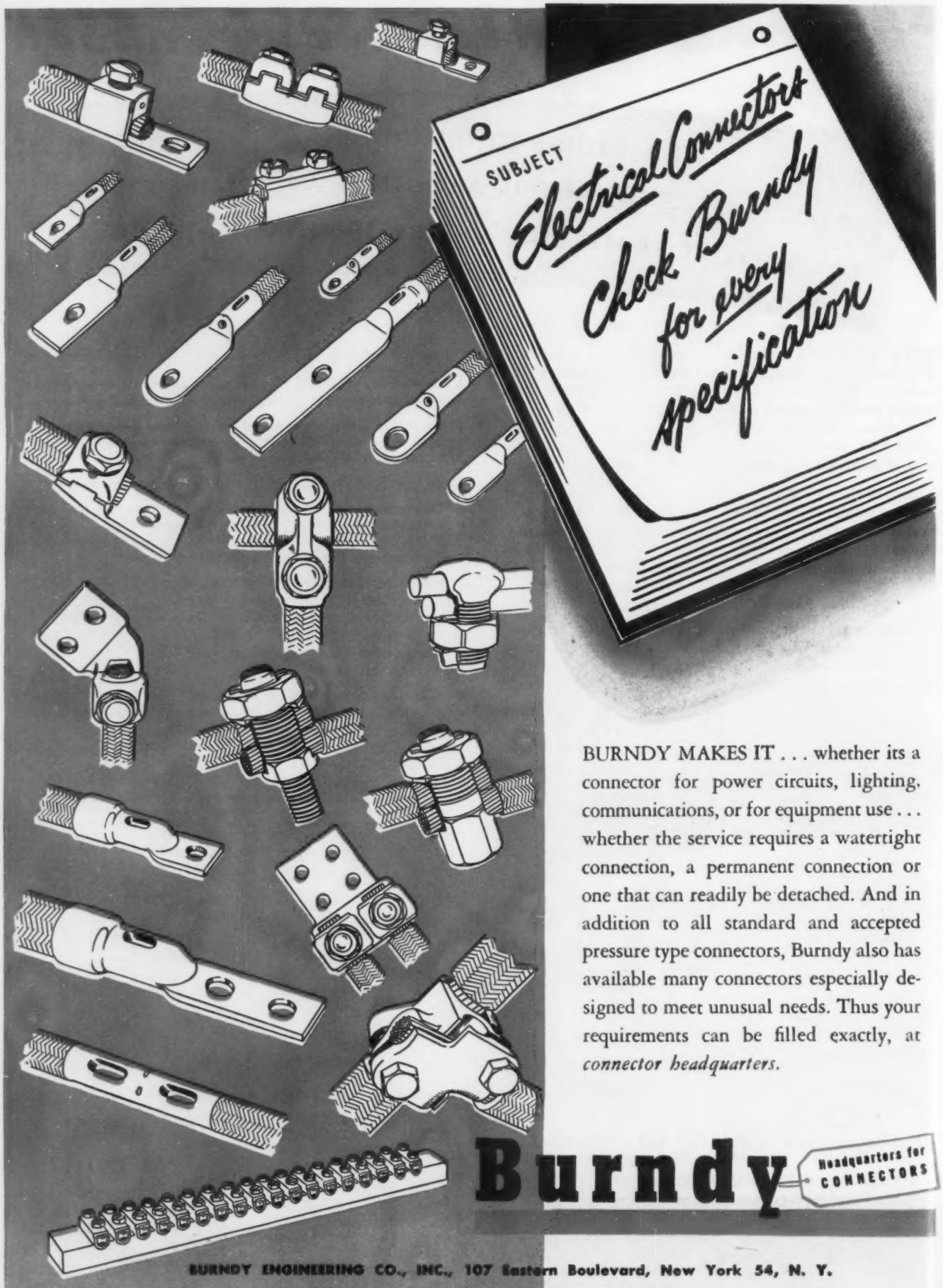


Hear the General Electric radio programs: "The G-E All-Girl Orchestra," Sunday 10 p. m. EWT, NBC; "The World Today" news, every weekday 6:45 p. m. EWT, CBS.

THE BEST INVESTMENT IN THE WORLD IS IN THIS COUNTRY'S FUTURE—BUY WAR BONDS

"TO MAKE LAMPS STAY BRIGHTER LONGER"
The Creed of G-E LAMP RESEARCH

G-E MAZDA LAMPS



BURNDY MAKES IT . . . whether its a connector for power circuits, lighting, communications, or for equipment use . . . whether the service requires a watertight connection, a permanent connection or one that can readily be detached. And in addition to all standard and accepted pressure type connectors, Burndy also has available many connectors especially designed to meet unusual needs. Thus your requirements can be filled exactly, at *connector headquarters.*

Burndy Headquarters for CONNECTORS

BURNDY ENGINEERING CO., INC., 107 Eastern Boulevard, New York 54, N. Y.
IN CANADA: Canadian Line Materials, Limited, Toronto 13

KELVINATOR SERVICE PROGRAM TO HELP BUILD CUSTOMER GOOD WILL!

TYING IN WITH "BETTER CARE—LESS REPAIR" PROGRAM, NATIONAL ADVERTISING SPEARHEADS PLAN FOR HOLDING AND BUILDING CUSTOMER GOOD WILL DURING CRITICAL SERVICE PERIOD AHEAD

The third war summer presents the greatest maintenance and repair problems ever faced by the appliance industry. To help boost the "Better Care—Less Repair" program, Kelvinator has built its 1944 Wartime Service program. Fully described in its plan book—"Keeping Friends Through Wartime Service"—it suggests how and where dealers can obtain new men; how to train them; how to handle customers to obtain friendly cooperation; and shows material from national magazine ads to dealer letters to help the dealer over the service hump this summer. Comprehensive and complete, the Kelvinator Wartime Service Program is offered at a time when it is most seriously needed!

BETTER CARE—LESS REPAIR is the theme of the two Users' Guides on both refrigerators and electric ranges. Each Guide tells housewives how to keep these appliances operating efficiently—gives a check list of the ten most important things to do before needlessly calling a service man.

NEW MAGAZINE ADS dramatize the utility and refrigerator dealers' determination to keep owners "in refrigeration" and "cooking facilities" for the duration. Breaking in June and July—just when the service rush will be heaviest—their big job is to gain the understanding and cooperation of customers if their service calls cannot be handled promptly. These striking color ads will appear in the *Saturday Evening Post, McCall's, Better Homes & Gardens, Good Housekeeping, Household, True Story* and *American Home!*

BETTER CARE — LESS REPAIR

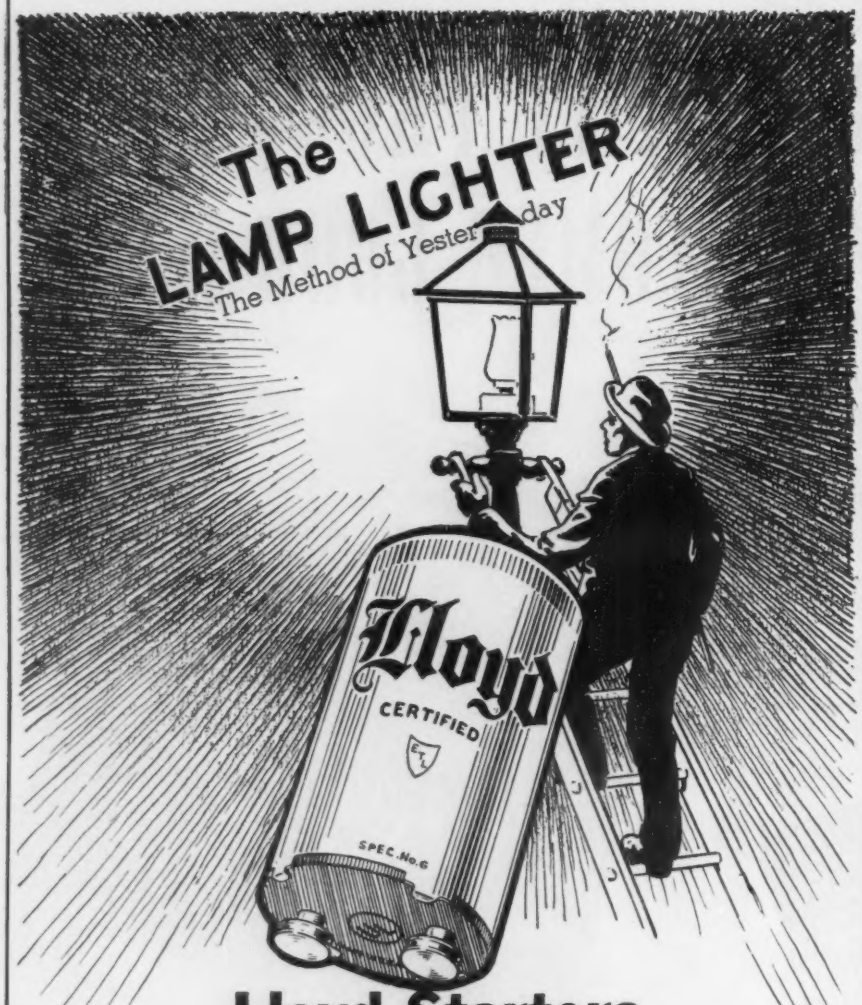
LOCAL NEWSPAPER ADS that obtain the friendly cooperation of customers are available to all Kelvinator dealers, in half a dozen economical sizes. These personalized "Better Care—Less Repair" ads take customers into the dealers' confidence, ask their help by playing up the free "Users' Guides."

Awarded Propeller Division, Nash-Kelvinator Corporation.

LOOK AHEAD WITH KELVINATOR

DIVISION OF NASH-KELVINATOR CORPORATION

Kenosha · Milwaukee · DETROIT · Grand Rapids · Lansing



Lloyd Starters

Marvel of Modern Science

Light the Lamps of Industry

Engineered for perfection in quick, sure starting of fluorescent lamps, Lloyd starters are lighting the lights for millions throughout the country.

Their better performance is assured by specifications more rigid than accepted standards for material and design.

Tests conducted periodically by nationally known laboratories, confirm that the life and performance of Lloyd starters are far in excess of standard requirements.

Cat. No. 353
Lamp Holder and
Starter Socket

Lloyd Starters are listed and approved by Underwriters' Lab. Inc., and Canadian Eng. Standards Assoc. Certified by Electrical Testing Lab.-Spec. 6. Certified to Fleur-O-Lier standards.

Remote
Starter Socket

Cat. No. 352
Patent Nos.
D133267—2280747

LLOYD POLICY INSURES QUALITY

LLOYD PRODUCTS COMPANY

Dept. EW-5 Providence 5, R. I.

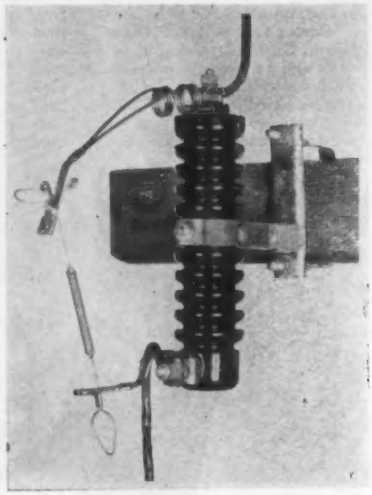
Representatives in 23 Leading Cities
Export Office: 13 E. 40th St., New York, N. Y.

Power Supplies (508)

Communication Measurements Laboratory has two new 1100 series voltage regulated power supplies, one a table model and the other designed for rack mounting. Both units use the series regulator circuit and, according to the manufacturer, a high-gain two-stage control circuit replaces the conventional single-stage circuit to insure low noise level and better regulation.

The high-voltage output can be shifted through a range of 225 to 325 volts by means of the potentiometer control on the front panel. The maximum current drain is 200 milliamperes from 225 to 300 volts and 180 milliamperes from 300 to 325 volts. Under these conditions, the sum of all a-c components present in the output is less than 5 millivolts, it is reported, and the change in voltage output from no load to full load is less than one volt. The primary of the power transformer is tapped for use at 105, 115 and 125 volts on a 50- to 60-cycle source. An unregulated heater supply winding of 6.3 volts at 5 amp. is furnished.

Fuse Cut-Out (509)



General Electric Co.'s flip-open fuse cutout provides overcurrent protection by means of a fuse link but without the conventional hinged fuseholder tube. These cutouts are rated 50 amp., 7,500/12,500 and 15,000 volts. They have clamp type line terminals, wet process solid porcelain insulator and spring contact arms. The fuse is supported in tension between spring contacts.

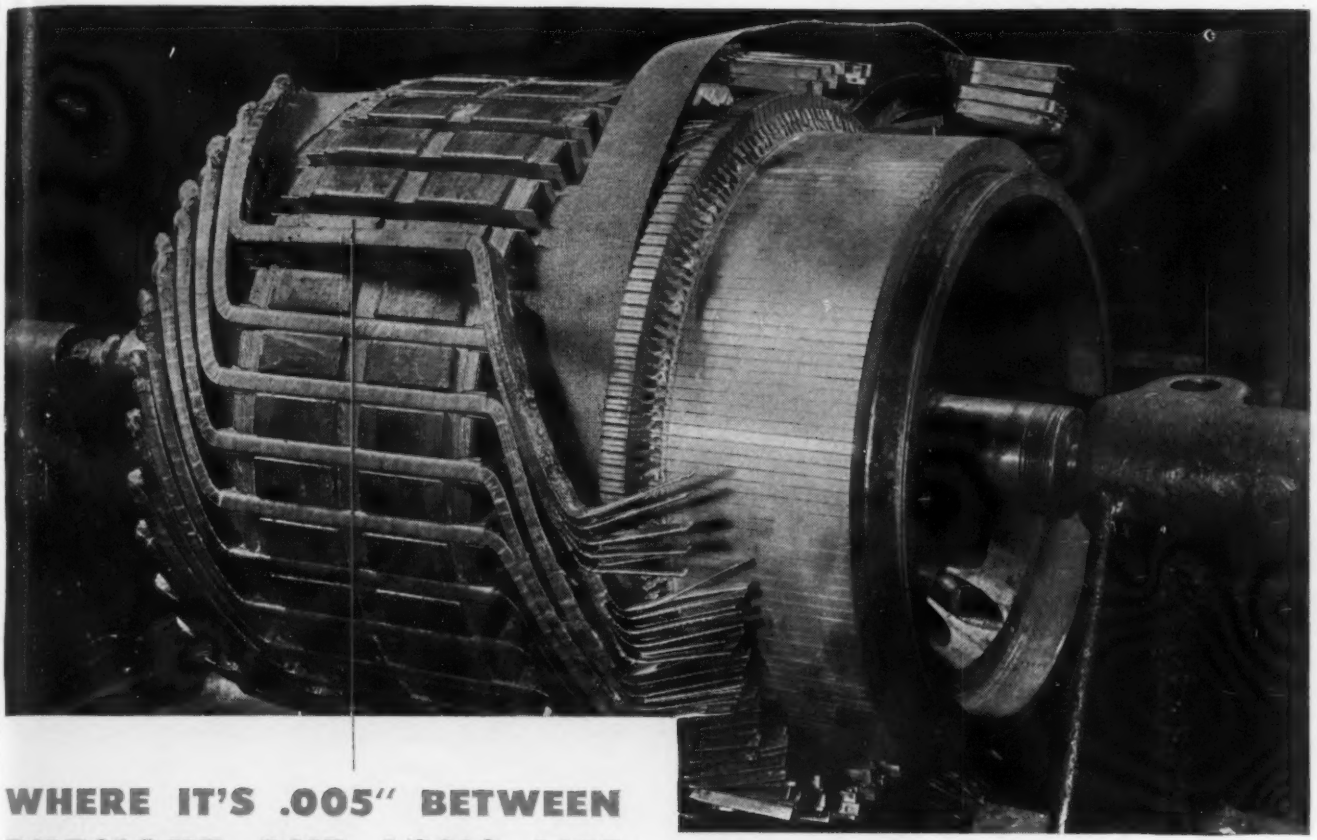
When the fuse link blows, the spring tension of the contacts widely separates the severed ends of the link, giving visual indication of the blown fuse from the ground at any angle. A switch stick is used to refuse the cutout.

Battery Clamp (510)

A battery hold-down clamp designed to aid in changing batteries under extreme climatic conditions, has been announced by the Paul Henry Co. According to the manufacturer, this clamp replaces the two wing nuts and by its use all safety wiring is eliminated.

Electrodes (511)

Frostrode Products is offering a line of refrigerated welding electrodes with replaceable Frostcaps of Mallory-3 metal. The new caps were designed for welding operations requiring high electrode pressures.



WHERE IT'S .005" BETWEEN BURNOUT AND LONG LIFE

...use insulation proved by fifty years of field tests!

There can be *only one "right" insulation* where space limitations allow insulation only .005" thick. That's the one that's adequately tested and proved for the application.

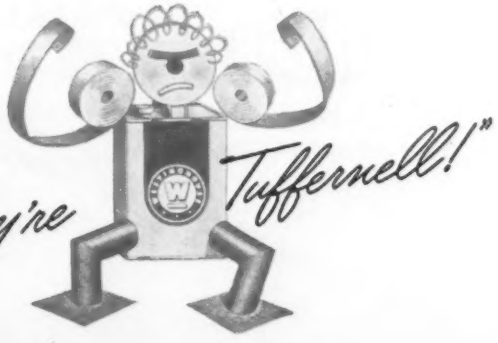
For the right insulating material for any and every job—investigate the Westinghouse line of "Tuffernell" Insulating Materials. They're the culmination of *fifty years of field tests* with every type of electrical equipment. Westinghouse insulation experience with all conceivable types of insulating materials has built up an authoritative file of exact application data. All of it is made available to you through Westinghouse Insulation Specialists.

Some valuable portions of this "insulation know-how" are included in the new Insulation Sample Book which simplifies selection of Micas, tapes, fabrics and papers *with actual samples*. It helps identify different grades, gives dimensions, ratings, and helpful application data. Copies are available through your nearest Westinghouse distributor. Ask for B-3322. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., Dept. 7-N. J-06356

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

INSULATING MATERIALS



"Gramp" YAEGER'S BACK ON THE JOB!

...and

Miller is back with 100% steel reflectors—the same rigid steel construction you knew and used and liked in 1941 and 1942.

WPB has lifted the ban on steel for reflectors! And WPB says, "When old-timers are provided with good lighting, tailored to their needs, it is frequently possible for them to keep on doing the precision work for which they are fitted."

MILLER 50 FOOT CANDLER or 100 FOOT CANDLER will provide plants with fine, man-made *daylight* . . . adequate, productive illumination evenly distributed over every working surface.

Better lighting will actually make workers see better, feel better, work better. It will help speed production, cut down spoilage, improve worker morale, reduce accidents, and make for smoother-running plants. And by using the Miller System, savings are effected in installation time and materials.

Just under 100 years of lighting experience . . . working with incandescent, fluorescent and mercury vapor . . . has enabled MILLER to offer through its engineers a lighting "expertness" which is at your command . . . to provide the best type of lighting system for your requirements. *Write or wire us today* and we'll get on the job at once.

BUY U. S. WAR BONDS

MILLER

50 FOOT CANDLER
100 FOOT CANDLER
Continuous Wireway Fluorescent Lighting Systems

THE MILLER COMPANY
MERIDEN, CONN.
Pioneers in Good Lighting Since 1844
• MILLER offers a complete line of filament and fluorescent lighting equipment

A MILLER Message in line with WPB's helpful handbook, "Plant Efficiency."

15 HENDY FEATURES

In the turbine—

1. Economical water rate per kwh.
2. Rigid spindles with discs having large hub sections form the backbone of the turbine structure and assure greater strength.
3. Step cut labyrinth diaphragm seals.
4. Steel Rateau nozzle discs with welded-in, rolled stainless steel nozzle blades and spacers.
5. Governing system that uses anti-friction bearings and is without stuffing boxes or soft packing.
6. Smooth, compact design without sacrifice of accessibility.

In the reduction gear—

7. Fabricated steel gear case, smoothly finished — no sharp corners or edges.
8. Rigidity combined with light weight.
9. External piping reduced to a minimum.

In the generator—

10. Rolled steel-plate field yoke of split type with halves bolted together.
11. Shock-proof, solid construction, giving greatest safety under adverse conditions.
12. Liberally dimensioned, providing capacity for emergency overloads.
13. High efficiency through careful design.
14. Self-aligning sleeve type bearing mounted in spherical seat insuring simple alignment of shaft.
15. Sixty-six years of generator building experience.

New.. POWER for a more electrified America

Built to the rigid requirements of U.S. Navy and Maritime Commission specifications for war service today, this Hendy Turbo-generator plant forecasts the standards for postwar electric generating equipment.

In developing its rugged, compact design, Hendy engineers swept the boards of old ideas—the result is a unit of sound reliability and long service life.

Construction features normally found only in larger turbo-generators are in these new Hendy power plants. These features insure larger factors of strength and safety, more economical operation and higher over-all efficiency.

Hendy turbo-generating plants are designed in a range of 250 to 750 kw permitting their use in a wide variety of marine and industrial service. Submission of your specification requirements is invited.

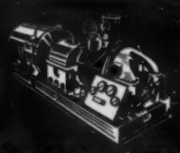
JOSHUA HENDY Division

JOSHUA HENDY IRON WORKS

SUNNYVALE, CALIFORNIA

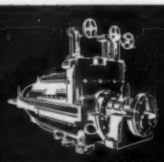
EST. 1856

BRANCH OFFICES: Boston • Buffalo • Chicago • Cincinnati • Cleveland • Detroit • New York • Philadelphia • Pittsburgh • San Francisco • St. Louis • Washington • Los Angeles



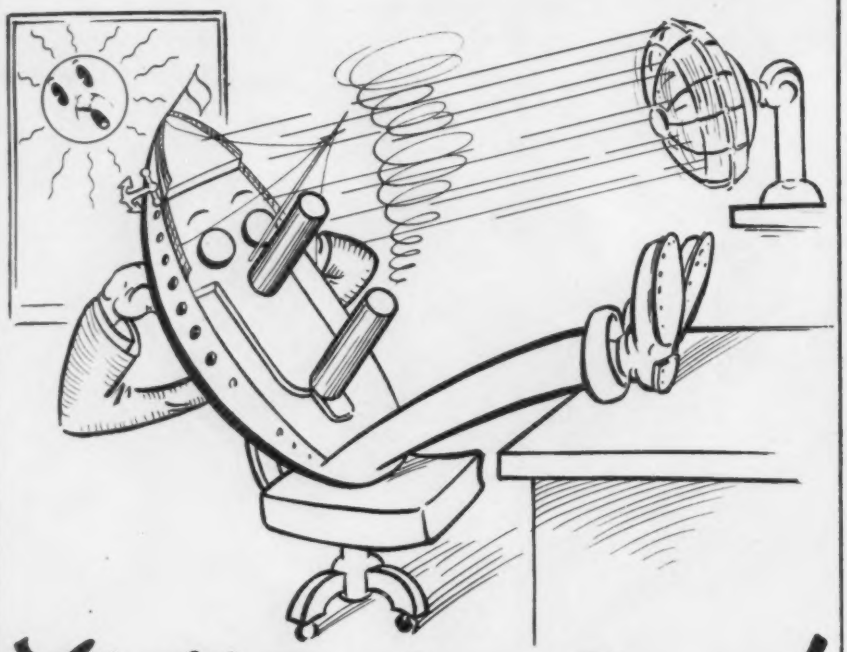
TURBO-GENERATORS

REDUCTION GEARS



STEAM TURBINES

DIESEL ENGINES



Well, Fan My Prow!

. . . said the ship to the supplier.
So, the Leo J. Meyberg Co. got busy. . .

IN A CALIFORNIA SHIPYARD, certain cargo vessels were being reconverted for military use. Suppliers were given tight deadlines to furnish materials. Among these were The B. F. Sturtevant Company, the nation's leading maker of mechanical blower equipment. Destined for tropical seas, the ships needed this ventilating equipment like your office needs a fan on a sizzling summer day. Electric motors to turn the fans were a No. 1 must. But who was to supply them? Motor manufacturers contacted were already working day and night to keep up with prior orders.

In this emergency, Sturtevant turned to the Leo J. Meyberg Co. Making use of our many sources of supply, a well known West Coast maker of motors was contacted who could fill the order. Working as a team, Meyberg and the two manufacturing firms delivered the goods—*on time.*

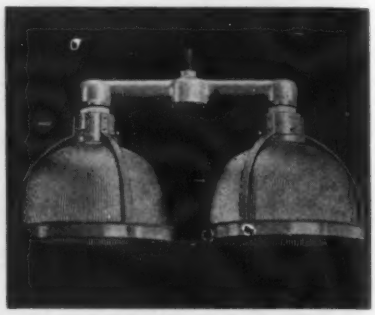
This makes a good story—yet it's an old story to us. We make a daily practice of supplying the electric and electronic merchandise you need *where* you need it, *when* you need it.

Call on us today, and let us prove it!

LEO J. MEYBERG CO.
Incorporated
70 Tenth St., SAN FRANCISCO, 3 TELEPHONE UN 1212
2027 S. Figueroa St., LOS ANGELES, 7 TELEPHONE PR 6011
MOST COMPREHENSIVE INDUSTRIAL ELECTRIC AND ELECTRONIC STOCKS IN THE WEST

Reflecting Unit (512)

Pittsburgh Reflector Co. has added to its line a reflecting unit which it states was designed to blend light from incandescent and mercury lamps to approximate daylight quality. These Dualight units are tapped for ¾-inch. conduit stem and are equipped



with removable plate to simplify wiring, with mogul sockets, safety holders, Permaflectors and reflector retaining rings. Permaflectors are available for broad, medium or concentrated light distribution from low- or high-bay mounting. Use of a 500-watt PS-40 and a 750- or 1,000-watt PS-52 incandescent lamp in conjunction with a 400-watt T-16 mercury lamp, with reflectors is suggested by the manufacturer.

F-Fixture (513)

The Excelux, a fluorescent unit for four 40-watt lamps, has been added to the Edwin F. Guth Co. line. The new unit is for administration areas, general offices and drafting rooms. A diffusing shield of contiguous multiple prisms is said to give full-screen diffusion. Relamping is by means of a retaining end hinge (patented). Available for unit type installations in close ceiling and suspension models.

Refrigeration Unit (514)

Airtemp Division, Chrysler Corp., is manufacturing an air-cooled 1½-hp. refrigeration unit for cooling resistance spot welders and for other specialized industrial liquid cooling service. The device is a packaged unit and is said to have ample capacity to cool all types of resistance spot welders when handling aluminum or ferrous metals.

Aircraft Transformer (515)

A midget a-c aircraft transformer line has been built by Westinghouse, using a new thin-gauge Hipersil steel core to cut weight. The new 35-kva. unit is about five inches wide and weighs 25 lb., according to the announcement, while the ordinary single-phase, 37½-kva. transformer weighs 680 lb: one with Hipersil core, 430 lb.

Terminal Connection (516)

A terminal connection for electrical wiring which has its insulation bonded to the terminal has been designed by Aircraft-Marine Products, Inc. According to the announcement, fitting of insulation sleeving over terminal connections is eliminated and visual inspection of connections is possible at all times.

Safety Sticker (517)

Avery Adhesives is offering a diagonal stripe, black and white sticker for marking obstructions in factories and other plants. The sticker has an adhesive backing which allows it to be applied without moistening.

G-E TEXTOLITE SOCKETS FOR ALL LOCATIONS

Here are sockets ideal for new wiring, rewiring or maintenance wiring. Their handsome appearance, strength and excellent insulating qualities make them suitable for installation anywhere . . . in factories, mills, warehouses, stores, homes, etc. Pull, push, key and keyless types are available.

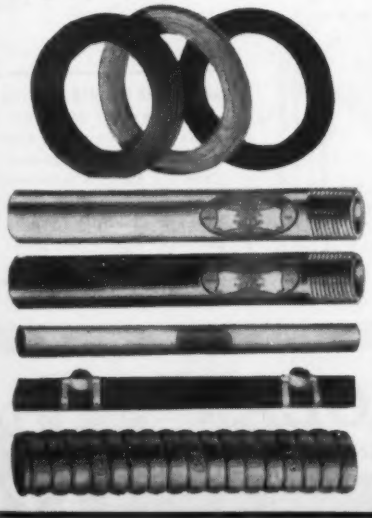
The bodies of these sockets are in one piece, totally enclosed. Caps and shells are self-insulated and will not rust, corrode, flake or tarnish. They have no linings to char. Threaded catch connections hold the cap and shell together securely regardless of vibration or constant handling.

All of these sockets have standard shadeholder threads which hold the shade securely without damage to the socket. Caps may be threaded or pendant.

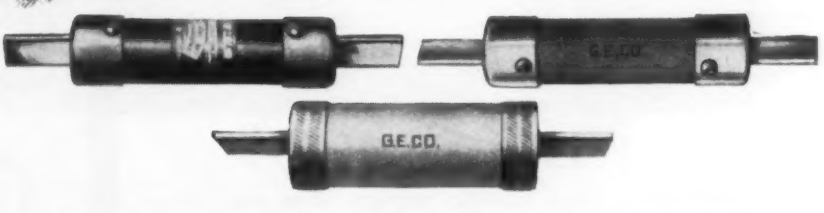
G-E BUILDING WIRES AND CONDUITS

The G-E wiring materials line also includes building wires and conduits for every purpose: Flamenol* Types SN and SNW small diameter building wires with thermo-plastic insulation, other wires; and G-E White and G-E Black rigid conduits, EMT, flexible metal conduit and Fiberduct.

*Reg. U.S. Pat. Off.



GENERAL ELECTRIC FUSES



G-E fuses provide reliable overload and short circuit protection for all electrical circuits. G-E nonrenewable enclosed fuses, G-E renewable enclosed fuses, G-E Silvend fuses with silver-plated contacts—all are available rated up to 600 amp., 250 V. or 600 V. These are the fuses General Electric uses to protect its own circuits.

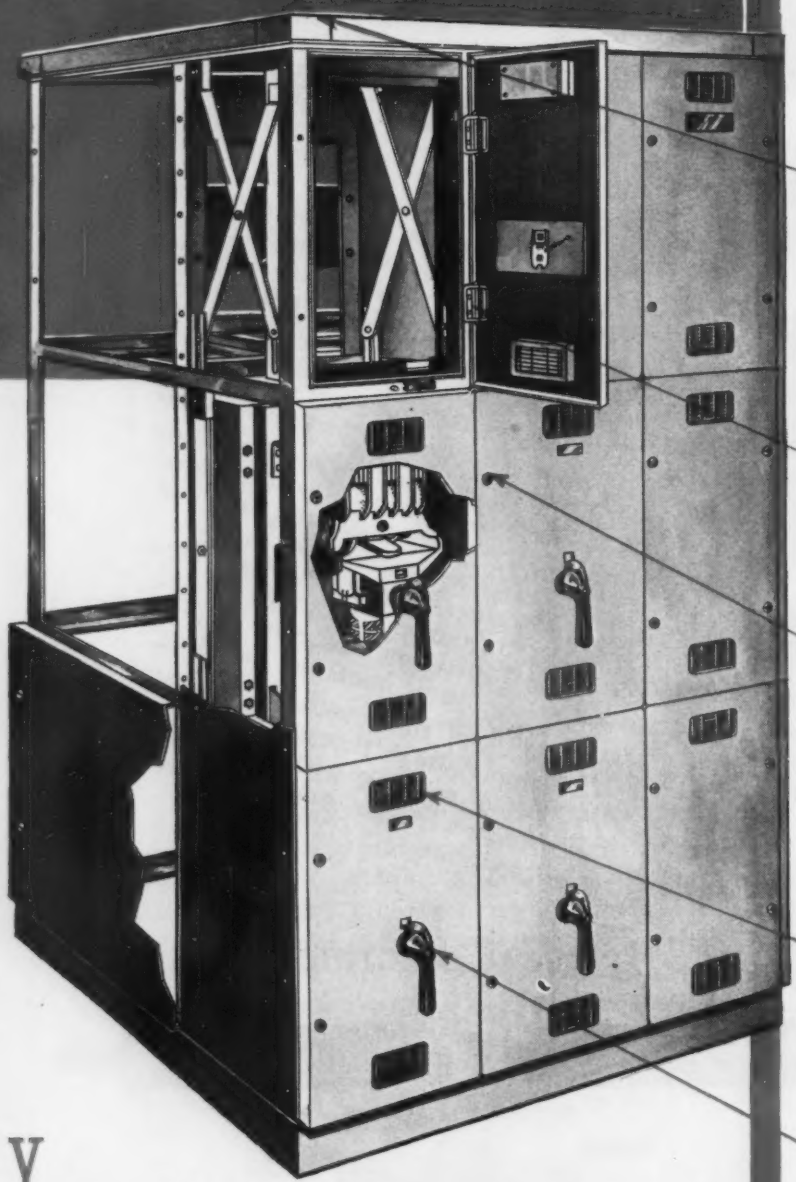
FOR FURTHER INFORMATION about G-E Textolite sockets, fuses, wire and cable or conduits, see the nearest G-E Merchandise Distributor or write to Section CDW543-18, Appliance and Merchandise Department, General Electric Company, Bridgeport, Conn.

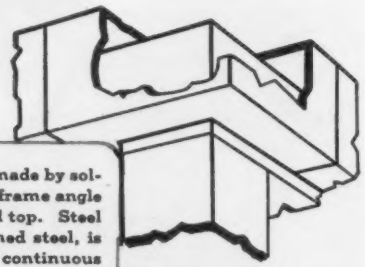
BUY WAR BONDS

HEAR the General Electric radio programs: The G-E "All Girl Orchestra" Sunday 10 P.M. EWT, NBC. "The World Today" news every weekday 6:45 P.M. EWT, CBS.

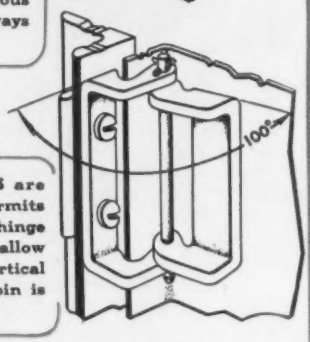
GENERAL ELECTRIC

IN DETAILS TOO – YOUR NEEDS GUIDE DESIGN OF I-T-E DRAWOUT SWITCHGEAR

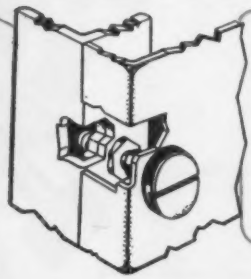




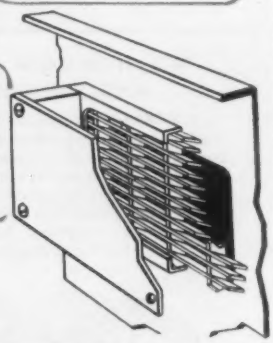
CORNERS are made by solidly welding frame angle to sheet-steel top. Steel trim, of formed steel, is added as a continuous finishing member always in alignment.



CONCEALED HINGES are sturdy. Design permits 100° swing. Slots in hinge and frame-angle allow horizontal and vertical alignment. Hingepin is readily removable.



PANEL SCREW has large head chamfered to prevent marring of finish. Palnut keeps screw attached to door at all times. Floating nut-block permits adjustment so that screw can be perfectly aligned with fastening thread.



LOUVERS are grille type, giving adequate air flow. Mounting is flush. Baffling is used when ventilating opening is close to arc chutes.

OPERATING HANDLE, mounted on front of door, disengages automatically when door is opened. Only 90° turn is required to close or trip the circuit breaker. Handle may be padlocked in open position.

You buy switchgear for long-term service. You want everything to be strong and dependable throughout. When a door is opened, you want it to swing far enough to give full access. To have ventilation, you want something more than a few holes "bumped" into a sheet of metal; you want louvers designed with plenty of engineering thought. With I-T-E switchgear you get careful design down to the last detail.

To plan switchgear, have a description of I-T-E design details at hand. Let an I-T-E engineer go over them with you. Have them written into your specifications. Descriptions are available in Bulletin 4207.

Representatives in Principal Cities

I-T-E

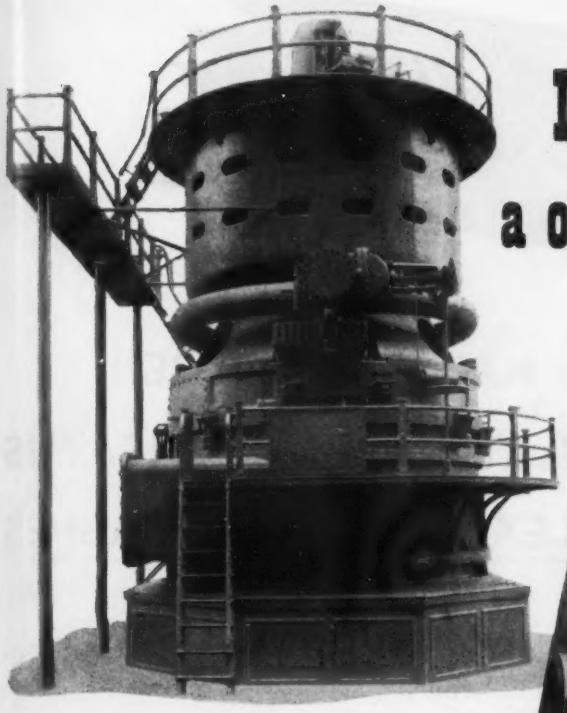
AIR SWITCHGEAR

IMMERSED IN AIR — ENCASED IN STEEL

The Army-Navy "E" for Production Excellence

I-T-E

CIRCUIT BREAKER CO., PHILADELPHIA 30, PA.



In 1903
a one-job oil was good enough...

(Above)
A granddaddy of the modern steam turbine. This 5,000 KW turbine-generator set of 1903 vintage operated at low steam temperatures and pressures... required no specially refined oil.

(Right)
Today's speedy, high-temperature turbines need an oil especially refined for turbine operation...an oil that prevents rust, and at the same time has superior oxidation stability.

BUT TODAY'S TURBINES NEED THIS 2-JOB TURBINE OIL!

1—That Prevents Rust
2—That has Superior Oxidation Stability

A GENERAL-PURPOSE, lubricating oil was plenty good enough for those lumbering, old giants of yesterday.

But to withstand the severe conditions encountered in modern turbine operation, an oil must do 2 jobs at once: (1) *prevent rust* (2) *resist oxidation*. It is this ability to do both jobs at once, to an unusual degree, that has built up for Shell Turbo Oil an enviable reputation for outstanding performance in every type of steam-turbine operation.

For more than a year Shell Turbine Oil has been doing duty aboard our battleships, destroyers, aircraft carriers and other units of our fleets, under operating conditions far more severe than any met on land. In fact, Shell Turbine Oil was the first of its type to be approved as meeting rigid U. S. Navy specifications.

With performance records like this no turbine operator can afford to ignore the possibility of using Shell Turbo Oil in his turbines. Call in the Shell man now. Or, if there is not a Shell office near you, write: Shell Oil Company, Inc., 50 W. 50th Street, New York 20, N. Y., or 100 Bush Street, San Francisco 6, California.

SHELL

SHELL TURBO OIL

Synthetic Rubber Replaces NATURAL RUBBER INSULATIONS AND SHEATHS ON SIMPLEX WIRES AND CABLES

Early in the war the scarcity of natural rubber made conservation necessary in order to make the best use of what was available. Our standards of quality and service had to be maintained with less rubber than we had been using. A few months ago, because of the rapidly dwindling supply of natural rubber, a complete change to synthetic rubber became imperative. Natural rubber could no longer be used in conductor insulation or cable sheath.

In anticipation of just such a situation, we already had investigated available substitute materials and were well along in the development of insulations and sheaths to replace all of our standard natural rubber compounds. The change-over is now practically complete.

A synthetic rubber compound has been provided to replace each of our special purpose, natural rubber insulations and sheaths. Laboratory tests and service records already indicate that they may be depended upon for trouble-free, efficient service. The technical and engineering skill that made our natural rubber compounds outstanding is now focused on obtaining even better quality and service with the new synthetic compounds.

If your postwar plans call for insulated wires and cables, or if you need them now for essential war work, it will be well worth your while to learn more about Simplex wires and cables with their new synthetic insulations and sheaths.

Simplex Wire & Cable Co., 79 Sidney Street, Cambridge 39, Mass.

ARMY (E) NAVY

Simplex WIRES and CABLES

PACIFIC COAST OFFICES

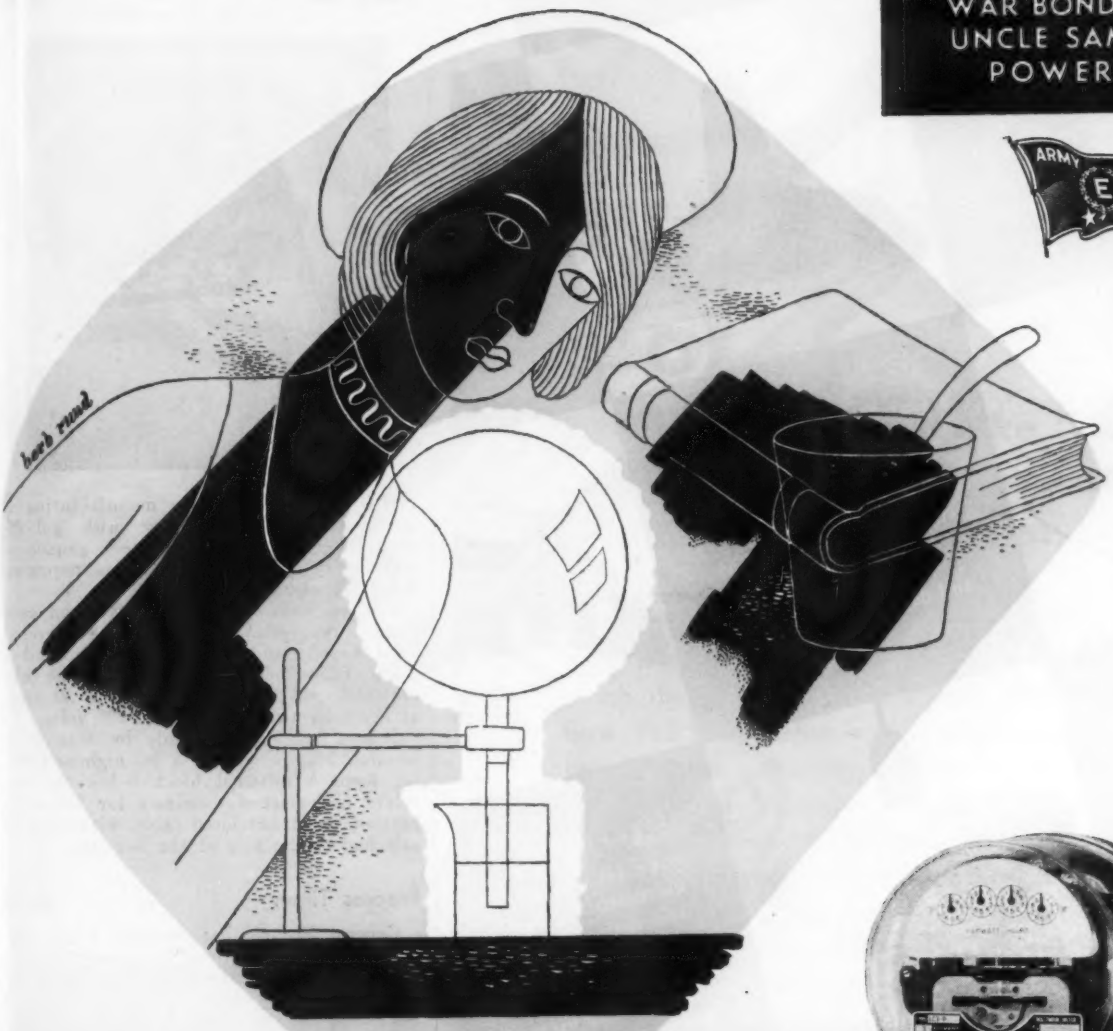
200 Fourth St., San Francisco, Calif.

910 East Third St., Los Angeles, Calif.

548 Poison Bldg., Seattle, Wash.

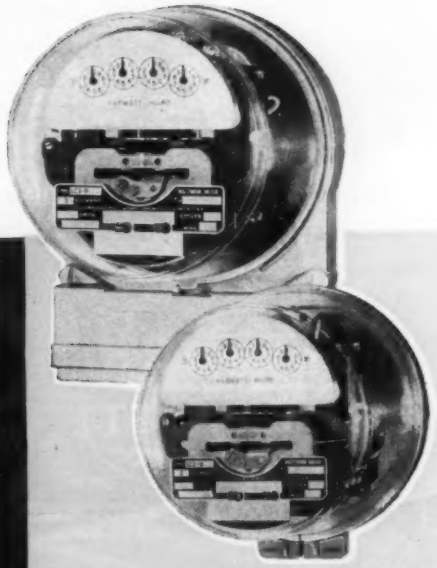
WAR BONDS MAKE
UNCLE SAM MORE
POWER-*full*

ARMY E NAVY



"On Measurement is founded the whole progress of man.."

A meteorologist in Uncle Sam's armed forces might well pause when he ponders the comparison between his modern scientific instruments and the original Galileo thermometer. The Galileo air-thermoscope consisted of a glass bulb containing air, connected to a glass tube of small bore dipping into a colored liquid. This contraption was affected by variations in atmospheric pressure as well as temperature changes, so our sixteenth century forefathers were never sure of the true temperature. Yet, this was the conception of accurate measurement. Compare it with today's high standard of measurement of electricity set and met by the electric utilities and the manufacturers of watthour meters.

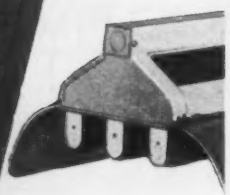


NO OTHER COMMODITY IS MEASURED SO *Accurately* AS ELECTRIC POWER

SANGAMO ELECTRIC COMPANY SPRINGFIELD ILLINOIS

Although our facilities are devoted to war production, Smoot-Holman still manufactures a full line of industrial and commercial lighting equipment for essential business.

Our production is concentrated on the Pacific Coast, eliminating cross-country shipping, and assuring a more immediate and dependable supply.



Sight-Craft lighting fulfills every requirement for better illumination, whether your needs are for conventional reflectors and luminaries, or for modern fluorescent equipment.

SMOOT-HOLMAN COMPANY
SIGHT-CRAFT
INGLEWOOD CALIFORNIA
MADE IN U.S.A.

SMOOT-HOLMAN
COMPANY
INGLEWOOD, CALIFORNIA

Relay Set (518)

H-B Instrument Co. is manufacturing a sensitive relay set for use with galvanometers, contact-equipped meters, gauges or other relay operating instruments requiring low-gram contact pressure.

The set consists of a sensitive iron core magnet type relay, which can be operated on 110 volts and two milliamperes, and a solenoid type mercury plunger relay, the tube of which will handle a load up to 30 amp. at 110 volts a-c or 20 amp. at 220 volts.

Relays are mounted side by side in a housing 5¾ in. wide, 5¼ in. high and 3½ in. deep. A terminal block below the two relays has marked terminals for line connection. A 4-ft. armored cable, with plug, is attached to the side of the housing.

Process Timer (519)

General Electric has designed a two-dial rotary type process timer for regulating the flow of products in catalytic processes such as production of hi-octane gasoline, butadiene for synthetic rubber and toluene for explosives.

Each of the two dials has two concentric rings or rows of 224 contact points each and each dial has a rotating contact arm. The arms are geared to a single shaft and may be driven through a clutch by a synchronous motor and adjustable gear train or operated independently from separate motors. Manual operation also is possible. The circuit to the segments is made and broken through an auxiliary switch, not at the segments, and the unit will handle control circuits of 10 amp., 125 volts, according to the announcement. Speed may be selected to suit the process.

Probe (520)

Alfred W. Barber Laboratories recently developed a new high-frequency probe for its wide-range vacuum tube voltmeter. The new probe is cone shaped with the "high" terminal in its nose to permit close connection to the circuit under test. It is molded from low-loss material to reduce to a minimum loading on the circuit under test, the manufacturer states.

Time Delay Switch (521)

An ambient compensated time delay switch, with contact capacity of 1,500 watts, 115/230 volts a-c, has been announced by the George Ulanet Co. Heater windings are wound for 6 to 230 volts. Heavy-duty electrolytic silver contacts are available normally open or normally closed. Weight, ¾ oz.; over-all dimensions, 2¾ x ¾ x ⅜ in.

A new money-saving serving tool

Patents Pending

To make "dead ends" in bethanized strand and Ruralductor

Here's money-saving news for the power and telephone industries. The news is the chromium-plated gadget, shown above, that looks rather like a towel rack trying to be a clothes hook. This is Bethlehem's new "serving tool," designed to help linemen make quick, easy "serves" on dead ends of bethanized strand and Ruralductor, on telephone and power lines.

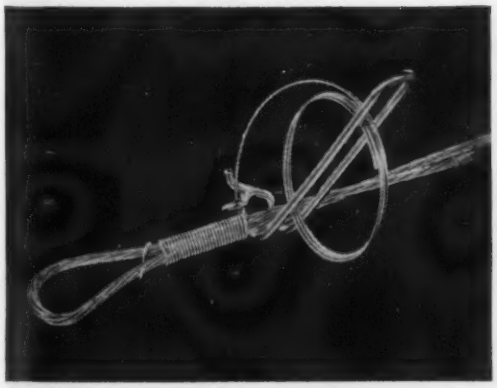
The "dead end coil" method, performed with this tool, does the work of clamps, or replaces the old familiar "breakdown serve," which, when made with pliers, invites corrosion by damaging zinc coatings. It provides for future take-up since the parent strand is not destroyed, as in "breakdown serves," and the dead end wrapping can be removed with the same tool.

Note the illustration of the tool, in process of wrapping 11-gauge bethanized dead end wire around a looped end of strand. And note the photograph of finished serves—*which tests have shown to have holding power above the useful strength of the strand.*

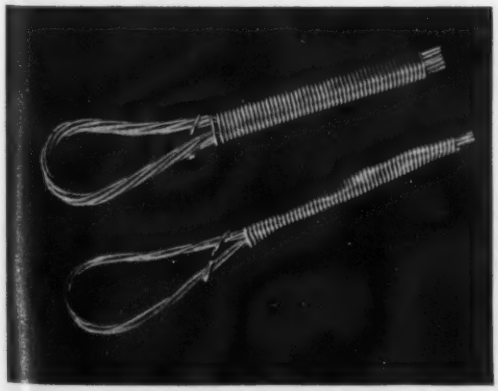
Any lineman can make these serves. The dead end wire is engaged between the two "fingers" projecting from the tool, which hold it under effective, steady tension while the tool is rotated. Fifty quick turns—and the job is done.

The action of the smooth, hard "fingers" of the tool displaces a minimum amount of the ductile, vise-tight zinc coating of bethanized wire or strand. However, the tool is recommended for use only on bethanized strand, as the holding power of the dead end is not always reliable with other types of coating.

If you are already using bethanized strand, you will of course find plenty of uses for the Bethlehem serving tool. If you haven't yet decided on bethanized—we suggest you fully consider the savings it will make for you, in combination with the tool. For full information, see the nearest Bethlehem representative, or write direct to Bethlehem Steel Company, Bethlehem, Pa.



The Bethlehem Serving Tool, in position, in a partly-completed serve.



Typical serves on 3- and 7-wire strand. Note the tight, uniform wrapping of wire.

BETHLEHEM STEEL

ILLINOIS PORCELAIN WIREHOLDER INSULATORS • • • *insure safe house service connections*

• Made in sufficient styles and sizes to meet all requirements, these dry process wireholders have rounded corners to prevent injury to the wire insulation. The screws with deep, sharp threads for easy installation, are fastened into the insulators with non-shrinking metal alloy. No rust streaks on the sides of buildings will occur. Wet process porcelain supplied on special order. Write for samples and prices.

•

ILLINOIS ELECTRIC PORCELAIN COMPANY

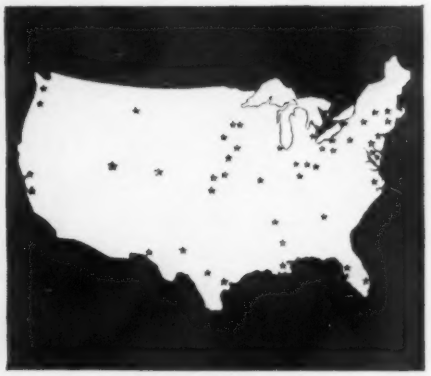
Macomb, Illinois

FRIGIDAIRE Authorized SERVICE — BETTER CARE LESS REPAIR

Frigidaire's Wartime Service Program Helps Dealers

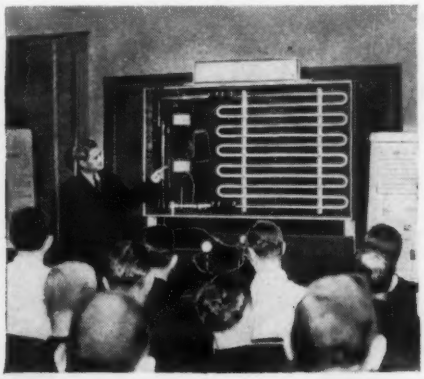
EXTENSIVE FACTORY FACILITIES are devoted to the manufacture and distribution of parts and assemblies, so that Frigidaire dealers may keep the millions of Frigidaire refrigerators and other installations in essential wartime operation.

PARTS—thousands of different kinds are stocked here, ready to be sent to dealers for use in Frigidaire models of the past 25 years. On hand for making these service parts are thousands of tools and dies used for the original Frigidaire parts.



45 DISTRICT SERVICE ORGANIZATIONS blanket the country, giving Frigidaire dealers everywhere quick access to the most commonly needed replacement parts, extensive repair facilities, supervisors who assist them on technical matters.

TRAINED TECHNICAL MEN are available to individual Frigidaire dealers to help them work out any special service problems that may arise...help the entire Frigidaire Dealer Organization in carrying out effective serviceman-training programs.



FIELD TRAINING SCHOOLS by factory and district instructors give hundreds of new and experienced servicemen basic and advanced training in Household and Commercial Refrigeration, Electric Range work. Night school classes are popular.

SERVICEMAN-TRAINING AIDS include Primary and Advanced Training Courses, streamlined field schools, 9 valuable training films, a timely manual and film on customer relations, Handy Reference Guides, 2 comprehensive Service Manuals.

5 IMPORTANT OBJECTIVES

Started more than two years ago, Frigidaire's Wartime Service Program is a *continuous* major activity to help dealers accomplish these important objectives:

1. To cooperate with the Government's Food Conservation and Health Protection programs.
2. To help keep the nation's refrigerators running.
3. To locate and train necessary service manpower.
4. To obtain essential service parts.
5. To build good will and maintain income.

For Excellence in War Production — ARMY E NAVY

FRIGIDAIRE
Division of
GENERAL MOTORS

Peacetime builders of
ELECTRIC REFRIGERATORS · RANGES · WATER HEATERS
HOME FREEZERS · ICE CREAM CABINETS
COMMERCIAL REFRIGERATION · AIR CONDITIONERS
BEVERAGE, MILK, AND WATER COOLERS

BUY MORE WAR BONDS FOR VICTORY!

★

Listen to
GENERAL MOTORS SYMPHONY OF THE AIR ...
Every Sunday Afternoon, NBC Network

★

BLACKBURN CONNECTORS

19 SEPARATE OPERATIONS INSURE THEIR Quality and Dependability

Millions in use throughout the world

Four operations alone are necessary for rounding all external and internal corners, to prevent nicking of wires and cutting of linesman's glove.

The slot of the bolt and the width of the sliding pressure bar are both machined to very close tolerances. This keeps the legs of the screw accurately spaced, insuring proper fit of the nut on the bolt and maximum strength of the thread.

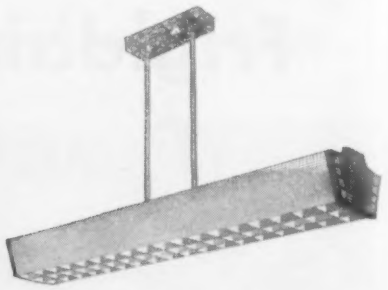
Blackburn Connectors are individually and thoroughly inspected before leaving our plant. You'll find them easy to install, and built to last indefinitely.

Over 75 Conveniently-located Jobbers' Stocks

JASPER BLACKBURN PRODUCTS CORP.
Main and Clinton Sts., St. Louis (6), Mo.
Builders of Quality Connectors for Over 10 Years

Fluorescent Unit (522)

Wakefield Brass Co. has a new fluorescent unit for office and drafting room, which is of all steel construction, with exception of louvers. Etched ribbed glass is used in the



side panels to eliminate glare and open louvers at the bottom prevent direct view of the lamp. Ballasts are mounted in an inverted position within the channel and are only partially enclosed to provide cooler operating conditions. Reflecting surfaces are white enamel of 88% reflectivity. Units are available with stem suspension or with close-up mounting for low-ceiling areas

BULLETINS

data books, etc.

Power Centers (523)

Westinghouse power centers are discussed in a 25-page booklet being distributed by the company. Feature of the publication is a timesaving guide to selection and specification of indoor and outdoor transformer installations, including coordinated disconnect and protective equipment. Standard arrangements are suggested to fit various types of distribution systems.

Fluorescent Units (524)

Daybrite Lighting Inc. has published a four-page bulletin describing its recently developed Coronado fixture for offices, drafting rooms, engineering departments, etc. Due to supplier difficulties, this fixture supersedes the manufacturer's Crusader unit, recently announced.

Maintenance (525)

A pocket-sized booklet, "Care and Maintenance of Electrical Equipment," has been published by Square D Co. Simple instructions for keeping switches, panelboards and switchboards in good operating condition are contained in the book's 28 pages.

Poster (526)

John C. Dolph Co. is offering a poster urging proper methods of insulating electrical units with varnish. Included is a benzine solvent chart.

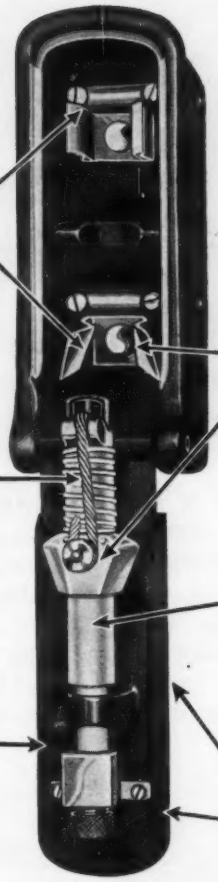
D-C Motors (527)

Century Electric Co. has released a pamphlet describing its line of direct-current motors, 1/6 to 300 hp.

LOWER HEAT RISE
NO BURNED CONTACTS
SURE INDICATION

Substantially built!
Two sizes:
50 amps., 5 KV
50 amps., 7½/12½ KV

Door stays closed!
Dirt, rain, snow
and ice stay out
but it indicates!



Old fashioned tried and true area contacts of phosphor bronze prevent excessive heat rise.

Wedge contacts take up ⅜ inch slack if carelessly left in links, and provide recoil on shorts.

Stainless steel spring puts normal tension of less than 2½ pounds on link, therefore no over-tensioning of links.

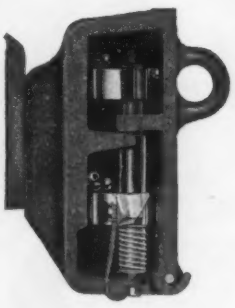
Shows fuseholder properly fused and ready to be closed in to housing. Door is easily attached in this position.

Fuseholder and door are removed or replaced as a unit. The door does not drop out.

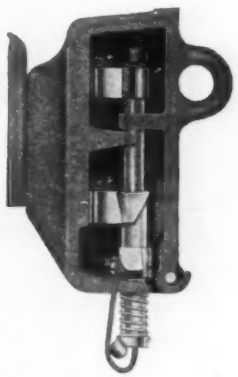
Note the clean simplicity and absence of weak or complicated parts or mechanisms.

STREAMLINED

Conserve vital metals, yet
comply with all NEMA Cutout Standards.
No other Porcelain Housed Primary
Cutouts give you as many advantages
as these time-tested Dropdown
Indicating Type Matthews Cutouts
Send for Bulletin 103
Try them at our risk.



Phantomized to show
closed position ready
to operate



Shows indicating position
with Fuse Link
separated

W. N. MATTHEWS CORPORATION, ST. LOUIS, U. S. A.

Engineers and Manufacturers Since 1899

When war plants shut down . . . when round-the-clock production stops . . . what can be done to take up the slack of "surplus" power?

We see three primary fields for the combined expansion of power and appliance use. Here they are:

Who'll take up

MARKET NO. 1

The New All-Electric Home

Before the war the idea of the "all-electric home" was taking root among home buyers . . . becoming accepted by architects, builders, and mortgagees.

The increased desirability of new homes with complete electric equipment already installed . . . with adequate wiring . . . with outlets throughout the house is definitely established. The trend toward built-in equipment will continue with increased impetus after the war.

General Electric is helping this trend by extensive advertising to the men who design, build, and finance new houses . . . and to the men and women who buy them.

The "all-electric home" will consume a considerable power load . . . will help solve the problems of peacetime conversion for utility companies.

MARKET NO. 2

More Appliances in Present Homes

Current surveys, such as the recent one by FORTUNE magazine, show a great pent-up demand for electric, labor-saving devices in present homes.

The homeowner is learning about such kitchen helps as the frozen food storage unit, electric range, dishwasher, garbage disposal unit, and water heater . . . such laundry helps as the automatic washer and ironer.

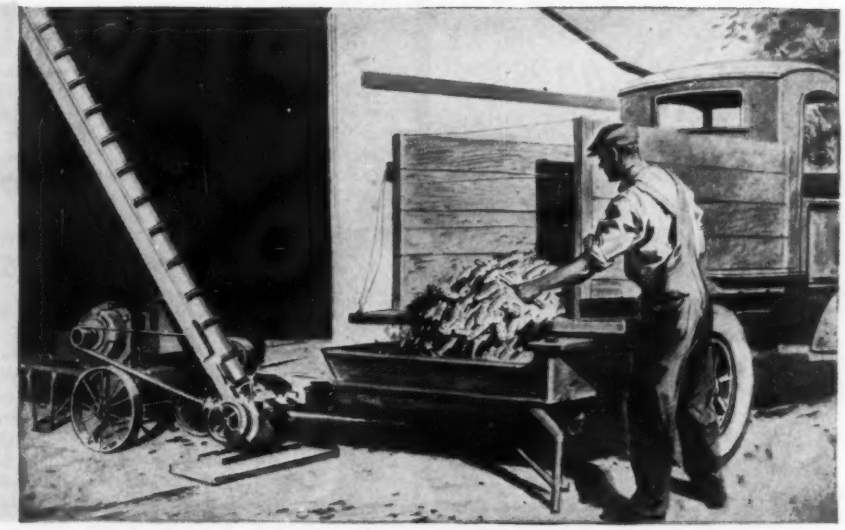
Through a wide educational campaign, General Electric is showing the public how to put these electric servants to work. We are confident of a great and growing demand for this equipment after the war.

This is the second postwar channel which will divert the power load from its war-factory outlets.

the slack in postwar power?

MARKET NO. 3

Farm work by Electricity



Here's one of the biggest potential markets of all. Approximately 2,500,000 farms are within one quarter mile of existing power lines.

And about 300,000 more farms will hook on to the hi-line every year after victory.

We are reaching the huge farm market through direct mail and national advertising. While there is a great deal of ground-work yet to be done both by General Electric and the power companies, rural electrification promises to be a prime market for added power consumption.

We realize the importance of using the tremendously expanded power capacity of the nation. Proper planning may mean the difference between prosperity and depression for large sections of our country.

General Electric is not waiting until the end of the war to recognize new power markets. We're promoting, advertising, and developing future sales of electric products and electric power today.

It is our feeling that a co-ordinated effort by General Electric and the utility companies will go still further toward making the adjustment to peacetime production relatively painless.

General Electric Appliance & Merchandise Department, Bridgeport, Conn.

FOR VICTORY

Today, General Electric is working full speed to hasten the day of Victory.

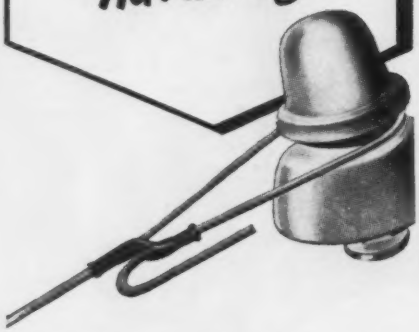
You can help, too, by buying War Bonds Now!

Everything Electrical for After-Victory Homes

GENERAL ELECTRIC

TUNE IN: "The G-E All-Girl Orchestra" Sunday 10 P.M.—E.W.T. NBC · "The World Today" news every weekday 6:45 P.M.—E.W.T. CBS

Nicopress OFFSET DEAD ENDS offer Many Advantages



1. They are designed for use on copper, Copperweld and Copperweld-copper conductors.
2. They can be installed on Pin, Strain or Spool insulators.
3. Simplicity and speed of installation.
4. Strength and tightness.
5. Provide for a tail of any desired length.
6. No extra tools are required to make the offset dead end as the same tool used in making regular line splices will do the job. These convenient Nicopress Tools are small and compact and are extremely easy to operate close to the insulators or cross arms.

THE NATIONAL TELEPHONE SUPPLY COMPANY

The National Telephone Supply Company

5100 SUPERIOR AVENUE
CLEVELAND 3, OHIO

Canadian Mfr.—N. SLATER CO., LTD., HAMILTON, ONT., CANADA
Export Distributor
INTERNATIONAL STANDARD ELECTRIC CORP., NEW YORK, N. Y.

Better Wiring (528)

Need for better wiring for better living in postwar homes is emphasized in a booklet published by Westinghouse Electric & Mfg. Co. Prepared for builders, contractors, architects, engineers and allied interests, this 64-page illustrated book gives plans for an average-priced home, including 18 individual electric circuits to make unnecessary future wiring additions and to provide improved service from electric appliances. Wiring diagrams and a complete floor plan explain why each circuit is necessary and how the electric load should be distributed.

Qualifications for the better wired home of 194X, according to the book, are (1) enough outlets for present and anticipated appliance and lighting needs: (2) enough circuits to distribute the electrical load properly; (3) enough switches for safety; (4) modern protection for all electrical circuits; (5) wiring and wiring devices of high quality.

Wiring System (529)

Thomas & Betts Co. is distributing a bulletin giving engineering details on its "Sta-Kon disconnect way of wiring." The system is based on a tip which is applied to ends of wires by Sta-Kon pressure tools. No solder is required, according to the manufacturer, and two identical tips meet in a beryllium copper spring coupler. Pictured in the bulletin are some of the devices which can be designed around these basic parts, including disconnectable two-way splices, three- and four-way splices, disconnect terminals, disconnect strips and blocks.

Plastic Tubing (530)

Fibronized extruded plastic tubing is described in an illustrated catalogue offered by Irvington Varnish & Insulator Co. Included are product data sheets giving characteristics and applications of several products.

Parts Booklets (531)

General Electric Co. has prepared the first of a series of nine parts publications covering electric instruments for radio and aircraft. Feature of the new publications is that parts are shown "exploded" in their proper relation to each other in an assembled instrument, making it possible to identify parts quickly and show construction clearly. According to the manufacturer, they are being published with the thought that they will prove helpful as training material as well as to those engaged in maintenance and repair work.

First of the series of loose leaf sheets are devoted to the 2½-in. d-c and rf. ammeters and voltmeters of the new internal-pivot design for both radio and aircraft.

Current Transformers (532)

R. E. Uptegraff Mfg. Co. has a new 32-page catalogue of its current and potential transformers. Mechanical data and prices as well as photographs and drawing of the various types are presented.

Slings (533)

Slings made by the John A. Roebling's Sons Co., are described in a 67-page booklet, recently published. This publication gives data on wire rope and grommet slings for both standard and special uses and on the new Roebling "Flatweave" sling. Recommended safe loads and size ranges are listed, and a section of the book is devoted to the various types of wire rope fittings used in connection with slings. Illustrated.

Combustion Control (534)

Leeds & Northrup Co. has issued a revised Metermax catalogue, showing recent installations of its full-metered system of combustion control for boiler furnaces.

Machine Tool Devices (535)

Ideal Commutator Dresser Co. is distributing a 12-page pamphlet giving information about its machine tool accessories. Included are three new items—the a-c magnetic chuck; combination etcher and demagnetizer; electric tachometer—in addition to triple-duty live centers; "machine shop" metal etcher, portable demagnetizers; grinding wheel dresser; balancing ways; variable-speed transmission; electric cleaners.

Catalogue (536)

O.Z. Electrical Mfg. Co. has prepared a new catalogue, No. 125. Included are specifications and new list prices for the company's line of conduit fittings, cable terminators, junction boxes, solderless connectors, power connectors and grounding devices. A handy "picture" index aids reference.

ELECTRICAL WEST, 68 Post St., San Francisco, 4, California

Please send me information about following CIRCLED items:

500 501 502 503 504 505 506 507 508 509 510 511
512 513 514 515 516 517 518 519 520 521 522 523
524 525 526 527 528 529 530 531 532 533 534 535
536

Name..... Company*..... Title*.....

Address.....

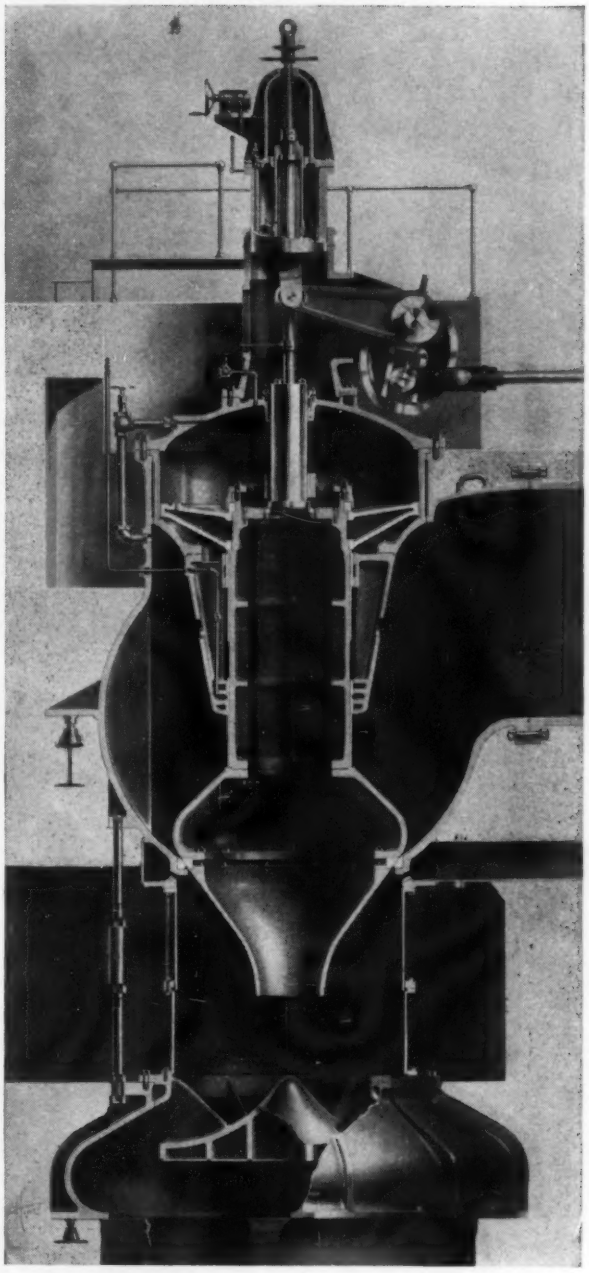
* Please include your company's name and your position, as we cannot ask manufacturers to furnish literature unless you do.

"SAFETY VALVE" *used in* HYDRO-ELECTRIC PLANT

The PELTON PRESSURE REGULATOR

is used at Pit No. 5

Pacific Gas and Electric Company



1. When the electrical output of a hydro-electric turbine is interrupted, the Pelton Pressure Regulator permits fast turbine control by discharging the excess water not needed by the turbine.

   This prevents excessive surges in the penstock which may burst the line. A Pressure Regulator costs less than the increase in cost of an average penstock husky enough to withstand surges resulting from sudden water shutdown.

2. Prevents sustained oscillations of pressure in penstock which would interfere seriously with speed regulation of turbine. Without a pressure regulator, smooth governing is difficult if not impossible.

3. Its Pilot Control was developed by Pelton so that a minimum of energy acting upon the pilot permits the water-balanced plunger to float up and down in instantaneous response to movement of pilot valve, thus eliminating the need of excessive governor effort to move the main plunger.

4. Protects generator and exciter from excessive overspeed, preventing dangerous overvoltage and centrifugal stresses.

5. Permits desired fractional downstream flow by synchronous by-pass operation of unit regardless of power output of turbine.

The Energy Absorber shown at the bottom of the photograph directs the water head-on into itself—takes a water jet of 30½ inches diameter flowing at 130-miles-per-hour, 450,000-gallons-per-minute, and slows it to stream velocity.

One Pelton Pressure Regulator and Energy Absorber of this type is installed on each of the *four* 50,000-hp. Pelton Turbines at Pit No. 5.

THE PELTON WATER WHEEL COMPANY

HYDRAULIC ENGINEERS

2929 Nineteenth Street San Francisco,10

BLW THE BALDWIN GROUP

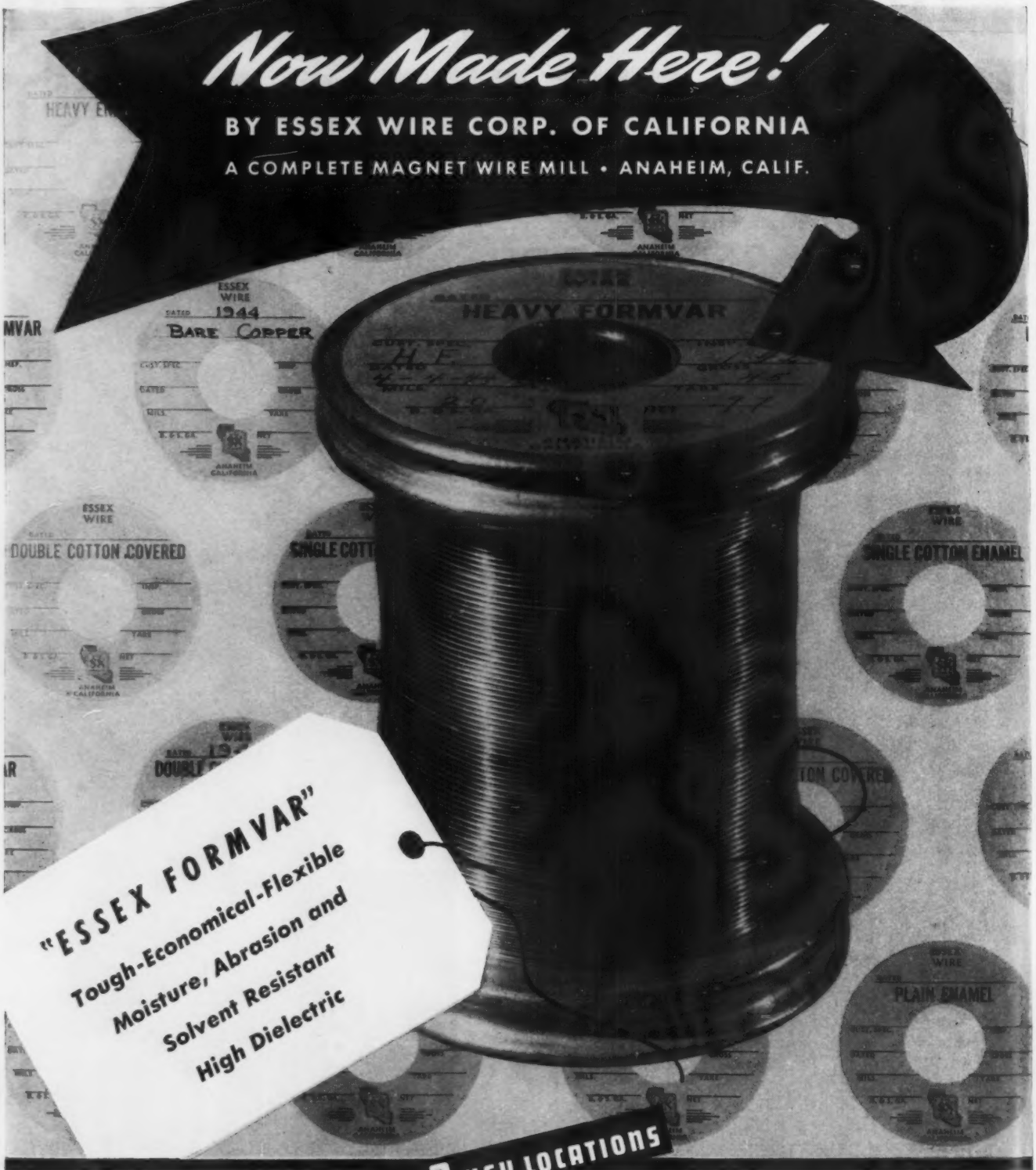
PELTON

Subsidiary of THE BALDWIN LOCOMOTIVE WORKS

Now Made Here!

BY ESSEX WIRE CORP. OF CALIFORNIA

A COMPLETE MAGNET WIRE MILL • ANAHEIM, CALIF.



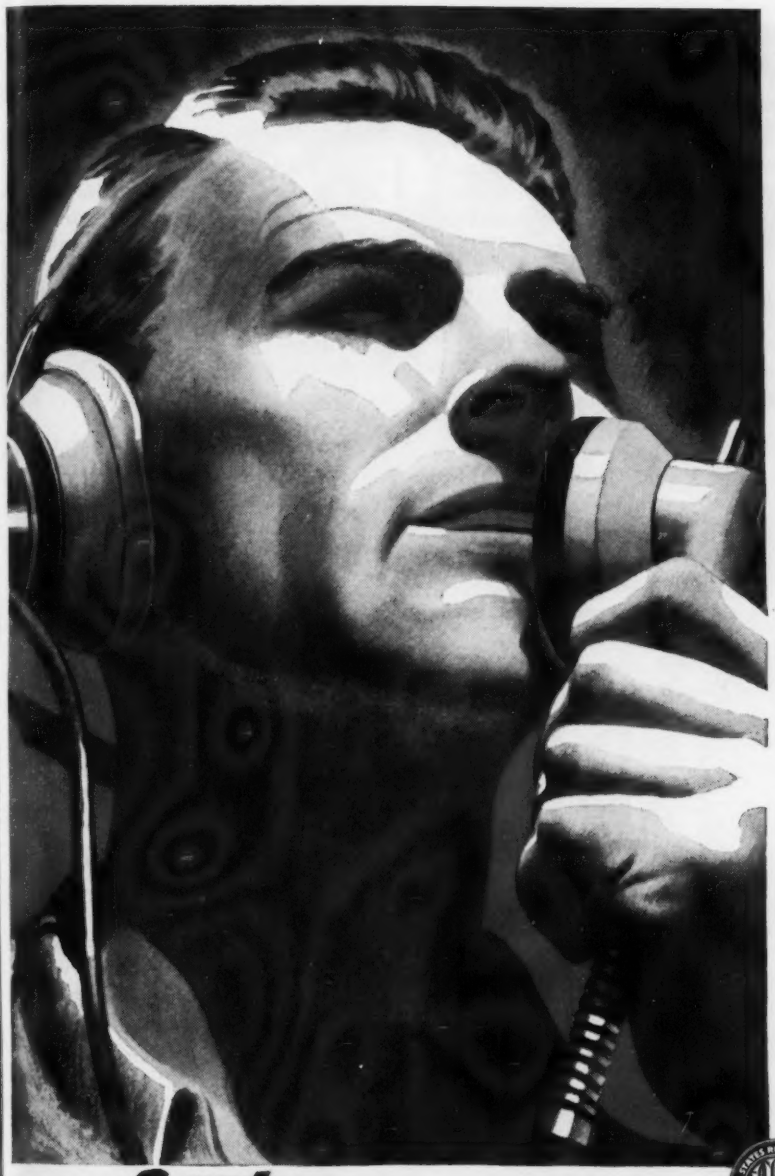
NOW AT 3 KEY LOCATIONS

SOLD AND DISTRIBUTED BY

TRI-STATE SUPPLY CORPORATIONS

LOS ANGELES	SAN FRANCISCO	SEATTLE
544 S. San Pedro St.	554 Bryant St.	318 Occidental Ave.
MUtual 2354	EXbrook 8890	MA 7146

CALL OR WRITE US TODAY



"FIGHTING WORDS"
—TAKE A LOT OF WIRE!

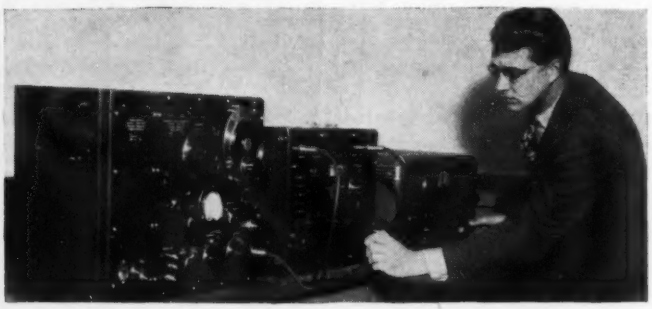
The ease with which wires and cables can be handled, speed with which they can be installed and readiness with which they can be maintained are tremendously important in battle-zones.

To get these advantages, the Signal Corps developed wires and cables having appreciably smaller diameters, with corresponding reductions in bulk and weight. Working in close cooperation with Signal Corps Engineers, U.S. Rubber Company engineers contributed the Laytex process.

Long before the war, this process was used for insulating small diameter wires for building, commercial and control circuits. The Laytex process made possible the famed lightweight Laytex Assault Wire of front line use, and has been adapted to a wide variety of other wires and cables for Ordnance, Corps of Engineers and the Navy.

When the day comes that we can again make peacetime versions of these smaller diameter wires and cables they will bring you extra advantages in meeting the increased capacity requirements of the vast new wiring, re-wiring and re-conversion markets. Smaller wires will save shipping and storage space—handling and installation will be easier.

Laytex WIRES AND CABLES — SERVING THROUGH SCIENCE



THE SCIENTIFICALLY CONTROLLED LAYTEX PROCESS is an exclusive method of (1) specially preparing and compounding wire insulation ingredients, and (2) applying the insulation. Purification operations remove 90% of moisture and water soluble impurities from liquid latex so as to form the basis for insulation of unusually high dielectric strength. Repeated dipping and drying followed by vulcanizing results in building up a homogeneous, small diameter insulation in which conductors are perfectly centered. The process is adaptable to the use of synthetic rubbers as well as natural rubber. In either, the insulation is compounded to resist extremes of temperature, from tropical heat to sub-zero cold. Evidence of this property is the global use of Laytex wires and cables by our Armed Forces.

Listen to the Philharmonic-Symphony program over the CBS network Sunday afternoon, 3:00 to 4:30 E.W.T. Carl Van Doren and a guest star present an interlude of historical significance.

UNITED STATES RUBBER COMPANY

1230 SIXTH AVENUE, ROCKEFELLER CENTER, NEW YORK 20, N. Y. • *In Canada:* DOMINION RUBBER CO., LTD.

ELECTRA'S HUSBAND

Twin Beds?

"JUST what particular variety of whips and jingles did you have last night?" Electra asked the other morning at the breakfast table. "You kicked and jumped like you were killing snakes. Was it something I fed you for dinner?"

"Uh-uh," I answered, "It was the control on the electric blanket. You had it too hot."

"Well after this put the switch on your side of the bed," she countered. "Or better still, we'll get twin beds."

"We'll get what?"

"You heard me," she answered. "Anyway I got the idea out of that magazine, *Business Week*, you brought home. I read a piece about a survey of family habits that you can take to heart. Read it on your way to the office this morning. I turned down the corner of the page."

People on the streetcar must have thought I was crazy that morning, the way I snickered over the magazine article. It summed up a survey of family behavior, attitudes and possessions conducted by the John B. Pierce foundation of New York. The findings were developed as a basis for future scientific home planning. Said *Business Week:*

"But much of the information will be of interest to other industries, such as manufacturers of clothing and household furnishings. The survey found, for example, that in summer 70.3% of the wives sleep in nightgowns, 24% in pajamas, 5% in the nude, 0.7% in shorts. Sixteen women reported that they would like to sleep in the nude . . .

"Furniture manufacturers and designers will find another section of the survey valuable. A special appendix of the study reveals that 87% of the husbands and wives sleep together in double beds. Only 5% of the wives are dissatisfied with this, but 40% think maybe twin beds would be ideal.

"The plumbing industry will be especially interested in the analysis of bathroom habits. A majority of apartment dwellers consider wash basins too small and 18% consider them too low. Grab rails (to aid in getting in and out of bath tubs) are wanted by 84% of those who don't have them. The majority of housewives reported toilet seats satisfactory as to size and shape . . .

"The foundation believes that it is presenting much family information for the first time. Such probably is the case, since the interviewers delved into intimate details of family relations.

"Thus it is noted that the average husband gets into bed and turns out the light later than the average wife, that he gets up earlier in the morning. But she spends only 14 minutes before falling asleep, which is less time than needed by her husband.

"Fifty per cent of the husbands report no activity after getting into bed. 22% read, 12% talk, 7% listen to the radio, 3% say their prayers, 2% smoke, 2% eat. Comparable percentages for wives were: 40% no activity, 29% read, 11% talk, 8% listen to the radio, 5% say their prayers; 3% think, 2% smoke and 1% eat. Twenty-six wives reported that their husbands had awakened them in the night during the week of the survey. Eight said this was on purpose, the rest that it was accidental.

"There is an indication of a taboo in the data concerning the presence of other family members during the operation of dressing or undressing. Some 63% of the wives reported that their husbands were present when they dressed and 72% said husbands were present when they undressed.

"Of equal interest is the table showing where women put on or remove particular items of clothing. As could be expected, most of them dress or undress in the bedroom or bathroom. But four reported that they put on their stockings, two that they put on brassieres, one that she put on panties in the kitchen or other room."

Oh yes, there was some information in the story for electrical home planners. Most of the women interviewed reported that they prefer large kitchens even though they may not be as convenient as smaller ones.

That evening when I came home I remarked to Electra that we weren't average, according to the survey.

"What do you mean?" she asked. "You're one of the two per cent that eat in bed. And what's worse you eat popcorn."

ELECTRA refuses to sympathize with me when I berate the organized efforts that are being made to regiment all engineers by blanketing them into one or two big unions. My claims that we are a professional group with no more reason for unionization than the medical or legal professions elicit the criticism that we have little background for any such contention.

She recently changed her opinions some when I read her a creed which has been prepared by the Engineers Council for Professional Development. It's called "Faith of the Engineer" and it sets forth:

I am an engineer. In my profession I take deep pride, but without vainglory; to it I owe solemn obligations that I am eager to fulfill.

As an engineer, I will participate in none but honest enterprise. To him that has engaged my services, as employer or client, I will give the utmost of performance or fidelity.

When needed, my skill and knowledge shall be given without reservation for the public good. From special capacity springs the obligation to use it well in the service of humanity; and I accept the challenge that this implies.

Jealous of the high repute of my calling, I will strive to protect the interests and the good name of any engineer that I know to be deserving; but I will not shrink, should duty dictate, from disclosing the truth regarding anyone that, by unscrupulous act, has shown himself unworthy of the profession.

Since the Age of Stone, human progress has been conditioned by the genius of my professional forbears. By them have been rendered usable to mankind Nature's vast resources of material and energy. By them have been vitalized and turned to practical account the principles of science and the revelations of technology. Except for this heritage of accumulated experience, my efforts would be feeble. I dedicate myself to the dissemination of engineering knowledge, and, especially, to the instruction of younger members of my profession in all its arts and traditions.

To my fellows I pledge, in the same full measure that I ask of them, integrity and fair dealing, tolerance and respect, and devotion to the standards and the dignity of our profession; with the consciousness, always, that our special expertness carries with it the obligation to serve humanity with complete sincerity.

A PLAN GROWS

IN BROOKLYN • NEW YORK • WASHINGTON • PHILADELPHIA

CHICAGO • BOSTON • SAN FRANCISCO • LOS ANGELES

and sweeps every State in the Union!

From Brooklyn to Los Angeles, appliance dealers enthusiastically acclaim the "U" Plan for "V" Day.

Well-attended meetings representative of the appliance industry heartily endorse the "U" Plan formula of post-war planning.

Large Specialty Retailer — "We would be remiss as merchandisers if we had not become identified with the Plan at once. One 'U' Plan mailing has already produced an amazing volume of post-war orders."

Mid-West Department Store Promotional Manager — "We have applied the 'U' Plan principle throughout our store and find it builds post-war business for many departments."

U plan for V day

Furniture Store Executive — "The 'U' Plan for 'V' Day lends itself well to our type of promotion. We particularly like the preference angle."

Western Utility New Business Manager— "Faced with the vital job of increasing domestic consumption after the war, the 'U' Plan is our opening gun in a campaign to put more appliances on our lines."

It was gratifying when trade paper editors gave the "U" Plan for "V" Day their blessing. It is really exciting now that dealers and distributors from coast-to-coast are acclaiming the Plan as it is presented to them at dealer meetings. Their approval is the best testimony we could possibly have that up to date the "U" Plan is the most complete, down-to-earth attempt to help dealers.

Universal contributes the Plan, the National Advertising, the 20-page Plan Book and a big free Promotional Package for identifying your store as "U" Plan Headquarters. Don't delay — send in the coupon today for your *free* Plan Book. Become a "U" Planner now— each month will bring you new services — new helps from Universal!

UNIVERSAL

LANDERS, FRARY & CLARK • NEW BRITAIN, CONN.

LANDERS, FRARY & CLARK Dept. EW
New Britain, Conn.

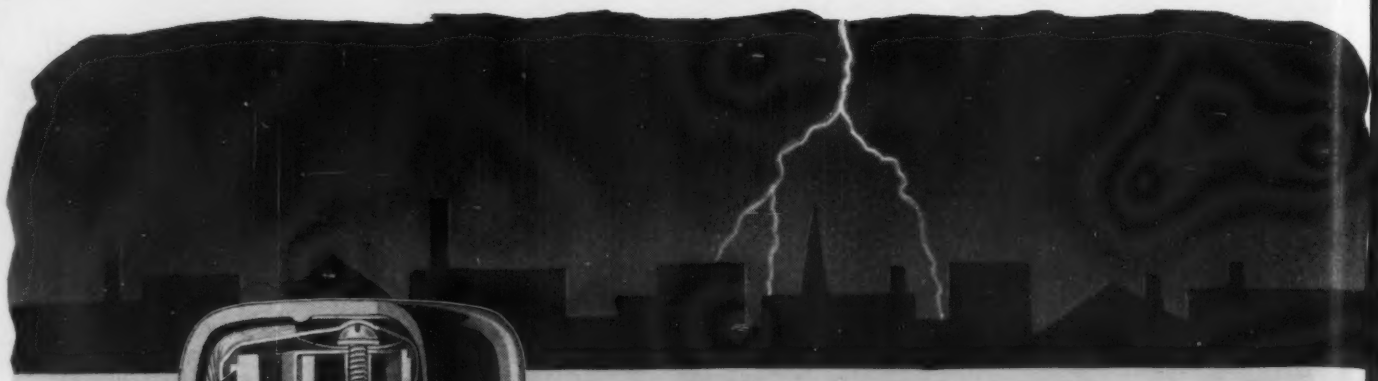
Gentlemen:

I wish to become a "U" Plan Dealer — please send free "U" Plan for "V" Day Plan Book to

*Name*_____

*Address*_____

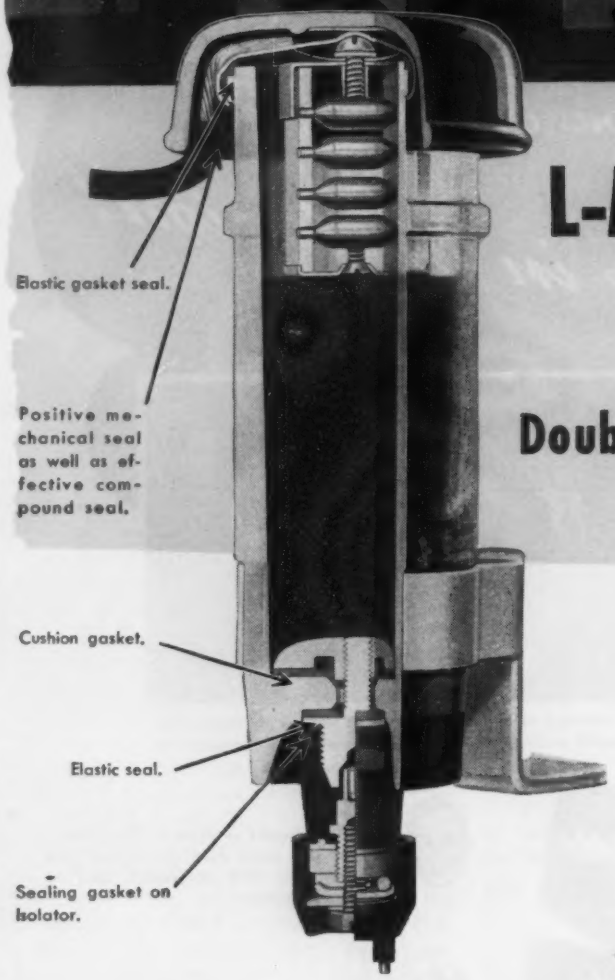
*City*_____ *State*_____



L-M Lightning Arresters

give you

Double ELASTIC Seal Against Moisture


Elastic gasket seal.
Positive mechanical seal as well as effective compound seal.
Cushion gasket.
Elastic seal.
Sealing gasket on Isolator.

Moisture is a deadly enemy of the lightning arrester. It condenses on the insulating parts of the spark gap . . . produces a partial short circuit of the gap . . . allows current to leak through.

L-M Lightning Arresters give you the advantage of elastic seals that insure perfect operation over years of service. These seals of natural or synthetic rubber cost many times as much as other materials commonly used, but they guarantee the long life you demand in your line protection equipment.

These L-M elastic seals on both top and bottom of the arrester positively keep out the moisture that pits and tarnishes the spark gap . . . and causes radio interference.

Years of actual service on the line have proven these additional long-life and protective advantages of L-M Lightning Arresters:

L-M valve material **that retains its characteristics over repeated surges.**

Electrically fast ladder gap **that insures maximum protection to the transformer.**

The Isolator **which eliminates outages caused by grounding of circuit through a damaged arrester.**

L-M DISTRIBUTION EQUIPMENT INCLUDES:

Transformers • Fuse Cutouts • Lightning Arresters • Oil Switches • Pole Line Hardware • Line Construction Specialties • Underground Equipment • Fibre Conduit • Street Lighting Equipment

For full information write to Line Material Company, Milwaukee, Wis.

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LINE MATERIAL COMPANY

LIGHTNING ARRESTERS

ELECTRICAL WEST

MAY, 1944
VOL. 92 NO. 5

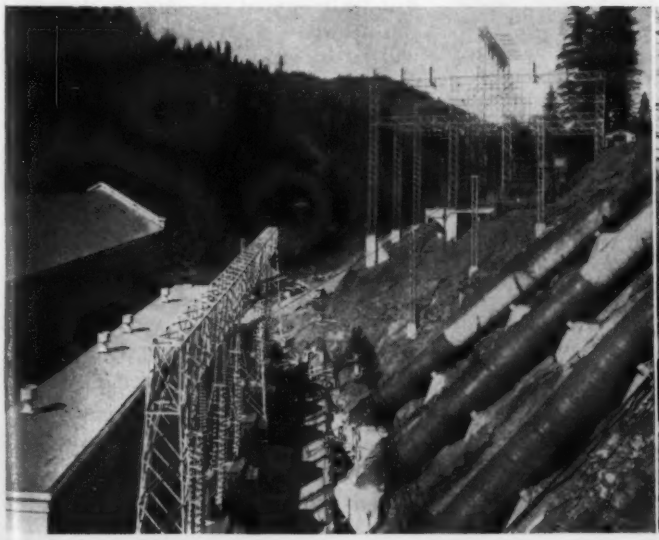
Pit 5 Designed for Simplicity, Economy

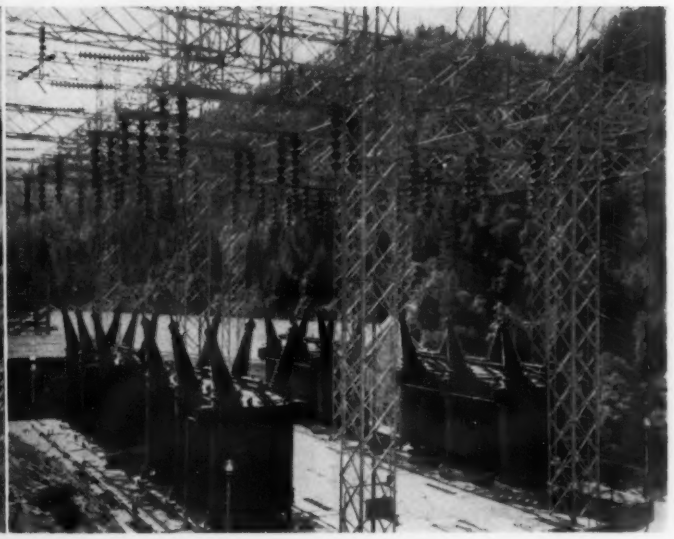
Project description by J. P. Jollyman, E. F. Maryatt, E. M. Wright, B. D. Dexter, T. J. Corwin, Pacific Gas and Electric Co.

PIT 5 hydro plant of Pacific Gas and Electric Co., with installed capacity of 160,000 kva., is twice the size of any other hydro plant of this company and is the largest privately owned hydro-electric plant in the state of California. When placed in operation on April 29 it became PG and E's fifty-second hydro plant, bringing the installed hydro capacity on this far-flung utility system serving all of northern California to 1,082,191 kva. Total system peak, a portion of which is supplied by other plants within the territory, will this year exceed 1,500,000 kw. Peak output in kilowatts from Pit 5 will be

With capacity of 160,000 kva., Pit 5 becomes largest hydro plant in California and largest of PG and E system with annual output of 836,000,000 kwh.

220-kv. transformer leads run to side-hill switch structure, through five-cycle breakers and to two transmission lines





Sliding gate diversion dam across Pit River will pass flood of 75,000 sec.-ft.

close to 150,000 kw., or 10% of the system peak.

The plant marks a major step in PG and E's coordinated long-range power development program and its normal annual output of about 836,000,000 kwh. constitutes another guarantee of ample power supply to war industries of the San Francisco Bay region and northern California. Pit 5 is the company's fourth plant on Pit River and its tributaries and makes use of a 3,300-cfs. diversion under a static head of 630 ft. Pit River drains some 4,800 square miles in northern California and joins the Sacramento River a short distance above the town of Redding. The Pit is an ideal power stream, having the largest and best regulated natural summer flow of any power stream in California.

Hydraulic Features

Pit 5 plant utilizes this favorable natural even flow of the river together with such storage as has been developed for the upstream plants. Diversion is by the low wheel-gate dam illustrated, some ten river-miles above the plant. Design of the structure was governed largely by the flood flow of the river. Based upon the spillway capacity of Pit 3 and Pit 4 dams, it was decided this structure should be capable of passing a flood of 75,000 cfs. without materially affecting the stage of the river. Such a flood is anticipated only once in a hundred years, but nevertheless had to be reckoned with in design of the project.

The dam might be described as a gated structure. It was designed to resist normal water pressure, uplift and earthquake forces. Length is 300 ft. with four 50-ft. gate openings separated by 15-ft. piers.

Gates

The gates are of the vertical lift wheel type, 52 ft. wide, 26 ft. high and weigh 90 tons, counterweighted with 55 tons. The twelve wheels on each gate bearing against steel rails have two 8-in. roller bearings each, and are capable of supporting a load of 160,000 lb. Over each gate there is a 75-ton double-drum hoist operated by a 10-hp. motor.

The gates will operate only when the plant is not capable of handling the entire river flow. Two gates are connected to separate floats. As the water rises causing the first float to switch to make contact, the gate will open about 1/10 ft. A time-delay is incorporated in the circuit to prevent the first gate from changing position too rapidly. If the water surface continues to rise to a point where the second float switch makes contact, this gate will rise about half a foot with only a small time interval before it again operates. In this manner it should be possible to control the water surface within the desired limits.

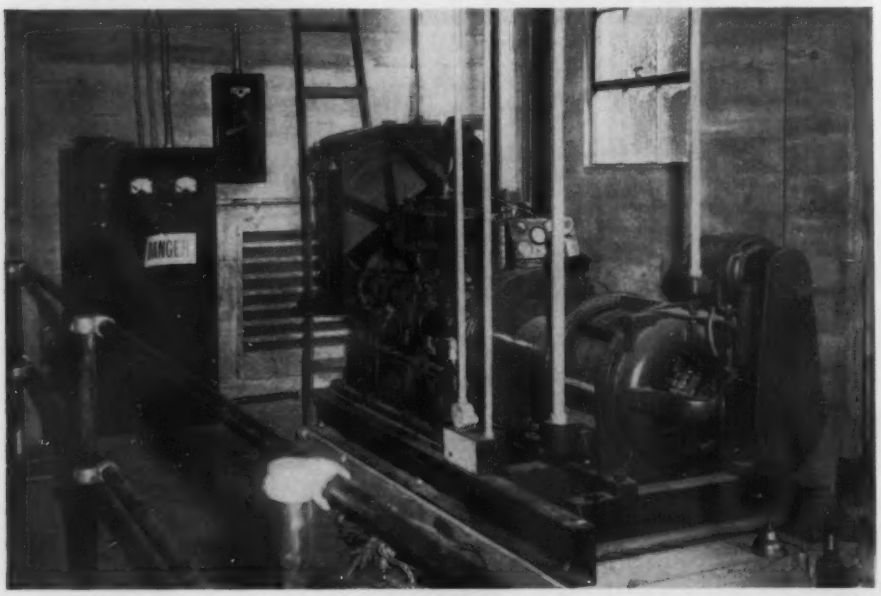
As positive insurance of power supply for the gate operating motors, the auxiliary engine-driven 50-kw. a-c generator illustrated was installed in the tunnel intake structure. Normal power supply is from an 11-kv. wood pole line from the power house.

Intake

The intake structure was designed to handle 3,300 cfs. with an average velocity of 2 ft. per second. Two automatic trash rakes will prevent accumulation of trash on the bars. These rakes will be mounted on cars so that they can be moved laterally. Time delays will be incorporated in the circuits so the mechanism can operate periodically when unattended.

Tunnel Gate

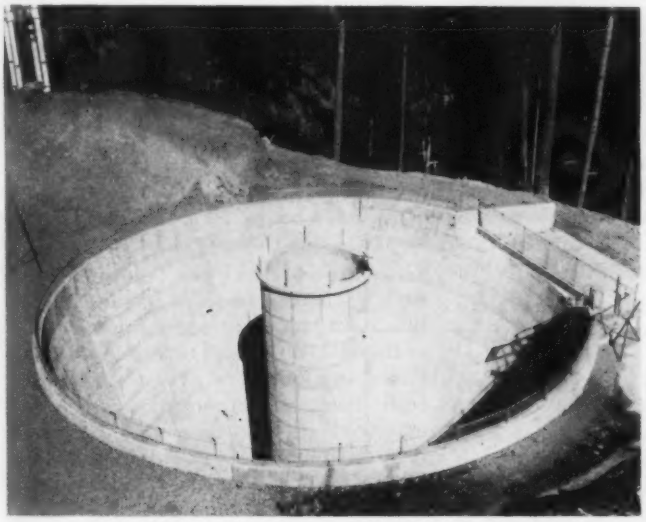
The tunnel gate is of the Stoney roller type, 15 ft. wide and 19 ft. high and counterweighted with concrete to insure closure under unbalanced pressure conditions. The gate is operated by a 35-ton motor-driven hoist located in the same structure that houses the auxiliary power supply unit.



Power supply for operating slide gates is assured by this 50-kw. a-c engine-driven unit in tunnel intake structure

A 19-ft. circular tunnel reinforced to withstand the full hydrostatic head extends some 5,000 ft. to a reservoir and terminates in an outlet structure designed to regain most of the velocity head. The reservoir was created by building a filled embankment containing 740,000 cu. yd. of material obtained nearby. To insure safety of this dam-like embankment a concrete siphon spillway was erected that will handle 4,100 cfs.

A second tunnel with bell-mouthed inlet structure which will contain an electronic fish screen extends about 23,000 ft. to the surge tank above the power house. Unusual difficulties taxing the ingenuity of construction engineers were encountered in building this tunnel, but heavy timbering, concrete arches and concrete lining produced a very fine smooth-bore tunnel.



Sides of the differential surge chamber were gunited at stages of 8 to 10 ft., which in effect formed an arch, thereby eliminating thousands of board feet of shoring

Unusual construction difficulties were encountered with the 19-ft. tunnel. In places the weight required 16 in. x 16 in. timbers on 4 ft. 4 in. centers with concrete arches between

The differential surge chamber shown is located to one side and near the end of the tunnel. It is 100 ft. deep, 88 ft. in diameter at the top and 40 ft. at the bottom. The riser is 16 ft. inside diameter, with 12-in wall. The tank has sufficient storage to supply the demands of the units while the flow in the tunnel is being accelerated. It will not spill on normal rejection of load.

At the lower end of the tunnel a manifold was constructed to change from the 19-ft. section to four 102-in. penstocks.

Penstocks

Immediately below the portal are four 120-in. butterfly valves operated by hydraulic cylinders under a head of 850 ft. These can be opened only from a position near the valve, but can be closed at the valve, the control house, the power house or by a flow meter, if the velocity in the penstock becomes excessive.

By-passes are provided around the valves for filling the penstocks; manholes were installed for access to any penstock without emptying the tunnel and standpipes were erected for entrance of air when a penstock is unwatered.

Each penstock is about 1,400 ft. long and varies from 102 x 3/8 in. to 90 x 1¼ in. Expansion joints are nickel clad steel and were packed in the shop prior to shipment. Penstocks were welded by the shielded electric arc process. Sections about 30 ft. long were fabricated in the shop. All welds were radiographed, repaired if necessary, and the sections then stress relieved. Each section then received a spun enamel lining for protection.

Power House

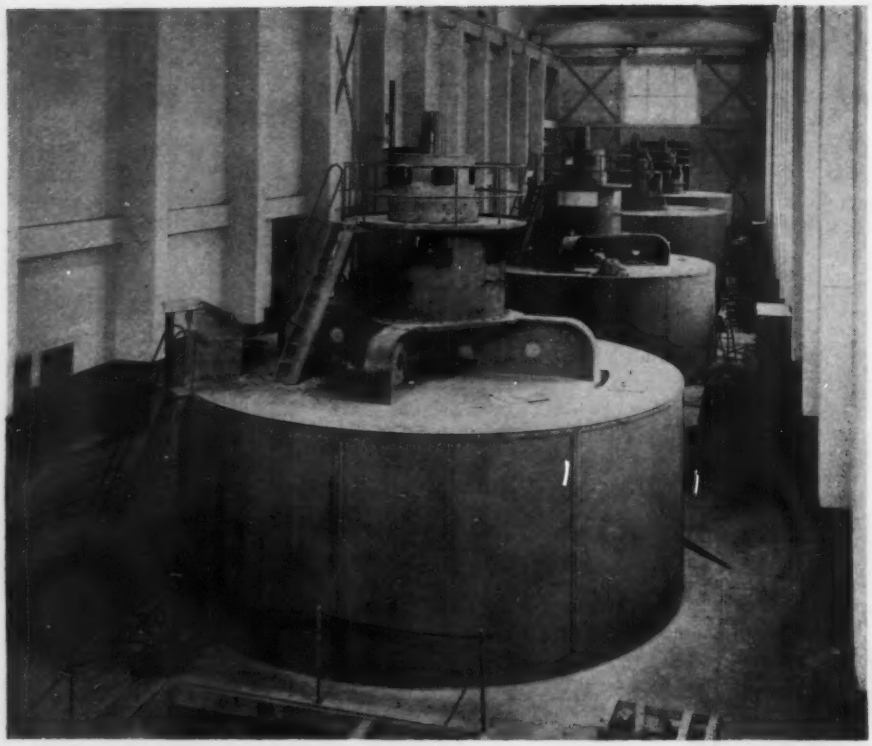
The power house is of reinforced concrete and structural steel, 264 ft. long and 90 ft. wide. Generator room is 75 ft. high and provided with two 100-ton cranes. The finished structure is safe for high river water, lateral loads due to wind or earthquake and the tractive force of the cranes.

Basic Design

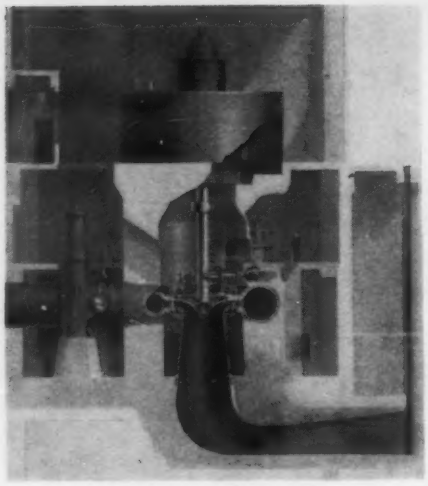
Number and size of units, bus and switching arrangement and auxiliary power supply were given careful study with the decision to build a four-unit plant, with generators rated at 40,000 kva., driven by 50,000-hp., 300 rpm., Francis type vertical turbines. This amount of power will nearly load up one 230-kv. transmission line. To avoid making it necessary to run the entire output of the station into one line or making it necessary to parallel the two lines at this point in order to divide the output, the four units in this station were split into two groups. These two groups are electrically separated from each other, permitting one group of two generators to feed into one transmission line and the other group of two generators to feed into the other line without its being necessary to parallel the two lines at this station.

Each group of two generators is supplied with one bank of step-up transformers of 81,000-kva. capacity, transforming the generator voltage of 11,500 volts to 230 kv. for transmission. Switching facilities are provided, permitting the two lines to be paralleled at 230 kv., but paralleling is not possible between the two generator groups at 11,500 volts. Paralleling at this voltage would require a 5,000-amp. oil circuit breaker which is undesirable and would defeat the element of segregation.

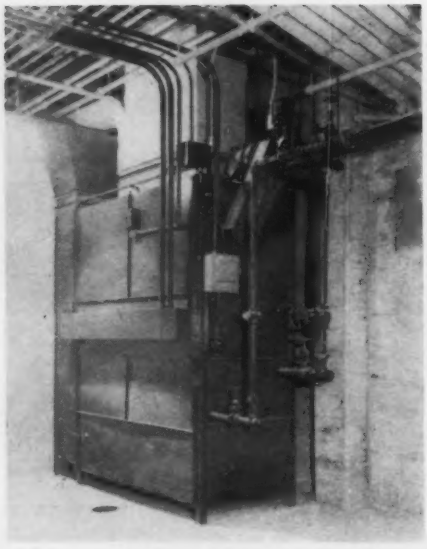
The principal reason for this division of output is an improvement in the stability of this portion of the system at the sending end. A greater reliability of service will be obtained and there will be less effect at the individual station if an outage of one line should occur. An advantage will also be realized by lessening the interruption to the stabilized flow of water in the river by a reduction in the amount of the power outage. This is an item of considerable importance in the operation of a chain of plants from one source of water.



Pit 5 power house is really two stations in one. The 4-40,000-kva. generators are grouped into two units of two each. Circuits are separate clear through



Photographic cross-section of one of the 50,000-hp. turbines and 40,000-kva. generators at Pit 5 power house. Shaft is bored for easy runner removal



Refrigeration and electric heating unit for air conditioning switchboard and change rooms. Heating and cooling also was provided for main generator room

Single-Line Diagram

Grouping of the units is immediately evident from the accompanying single-line diagram. It will be observed that the two generators of each group feed into a section of 11.5-kv. bus, one oil circuit breaker for each generator connecting it directly to the main 11.5-kv. bus. This main bus feeds directly into one bank of transformers through a disconnecting switch only, and the 230-kv. leads from each bank of transformers run directly to two 230-kv. oil circuit breakers, each breaker connecting to one of the two 230-kv. outgoing lines.

By means of the four 230-kv. oil circuit breakers, connection may be made between either transformer bank to either of the outgoing lines, or between both transformer banks and either of the outgoing lines, or between both of the outgoing lines and either one of the transformer banks. These breakers are five-cycle breakers pneumatically operated. This operating mechanism is comparatively new. It consists of a cabinet mounted at one end of the oil circuit breaker which contains a small compressor, small receiving tank and the operating cylinder for the breaker and controls. Heaters are provided within the cabinet to prevent freezing. To add to the flexibility, remotely operated air break disconnecting switches are included in each outgoing line.

All 11.5-kv. connections between the generators and the transformer banks including the 11.5-kv. bus are metal enclosed, 23-kv. porcelain insulated bare copper bus bars, completely fabricated and assembled in the factory before shipment. Each 11.5-kv. bus, consisting of one main and one transfer bus, and oil circuit breaker group is of standard metal-clad cubicle construction. Each circuit position, except that of the main transformer bank, is equipped with one oil circuit breaker, disconnecting switches, and transfer switches. The switches are gang operated and completely interlocked.

There is one spare oil circuit breaker with disconnecting switches. By means of this main and transfer bus arrangement, the spare oil circuit breaker may be substituted for any of the other breakers if necessary, permitting a minimum of 11.5-kv. equipment.

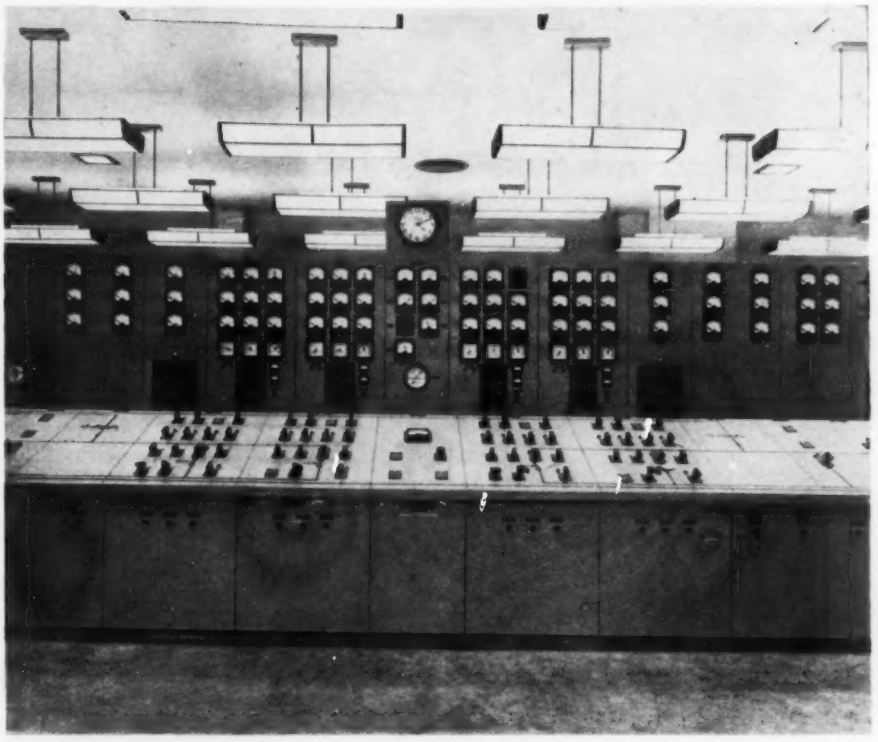
Two station service transformer banks are provided, one being fed from each of the two sections of the 11.5-kv. bus, each transformer feeding to a separate 440-volt bus. These two 440-volt buses supply all station auxiliary equipment, the circuits of which are arranged so that they may be transferred from one 440-volt bus to the other through electrically and mechanically interlocked double-throw switches controlled from the switchboard. Thus, all station auxiliary equipment may be supplied from either of the two-unit sections of the plant, or the load may be divided between them. In no case is it possible to parallel the two 440-volt buses which would parallel the two sections of the station.

Also feeding from each of these 11.5-kv. bus sections is a circuit to which may be connected one, two or three 12,500-kva., three-phase reactors. The reactors may be connected to either of the 11.5-kv. bus sections through double-acting switching arrangement, but not to both sections at the same time. These reactors are necessary because of the long lengths of 220-kv. transmission line which it will be necessary to charge from this station. The reactors will counteract part of the excessive line capacity.

Air Conditioning

To reduce the entrance of dust to a minimum and to maintain a comfortable temperature within the power

Fluorescent lighting of main switchboard room provides 60 foot-candles of non-glare lighting with minimum heat



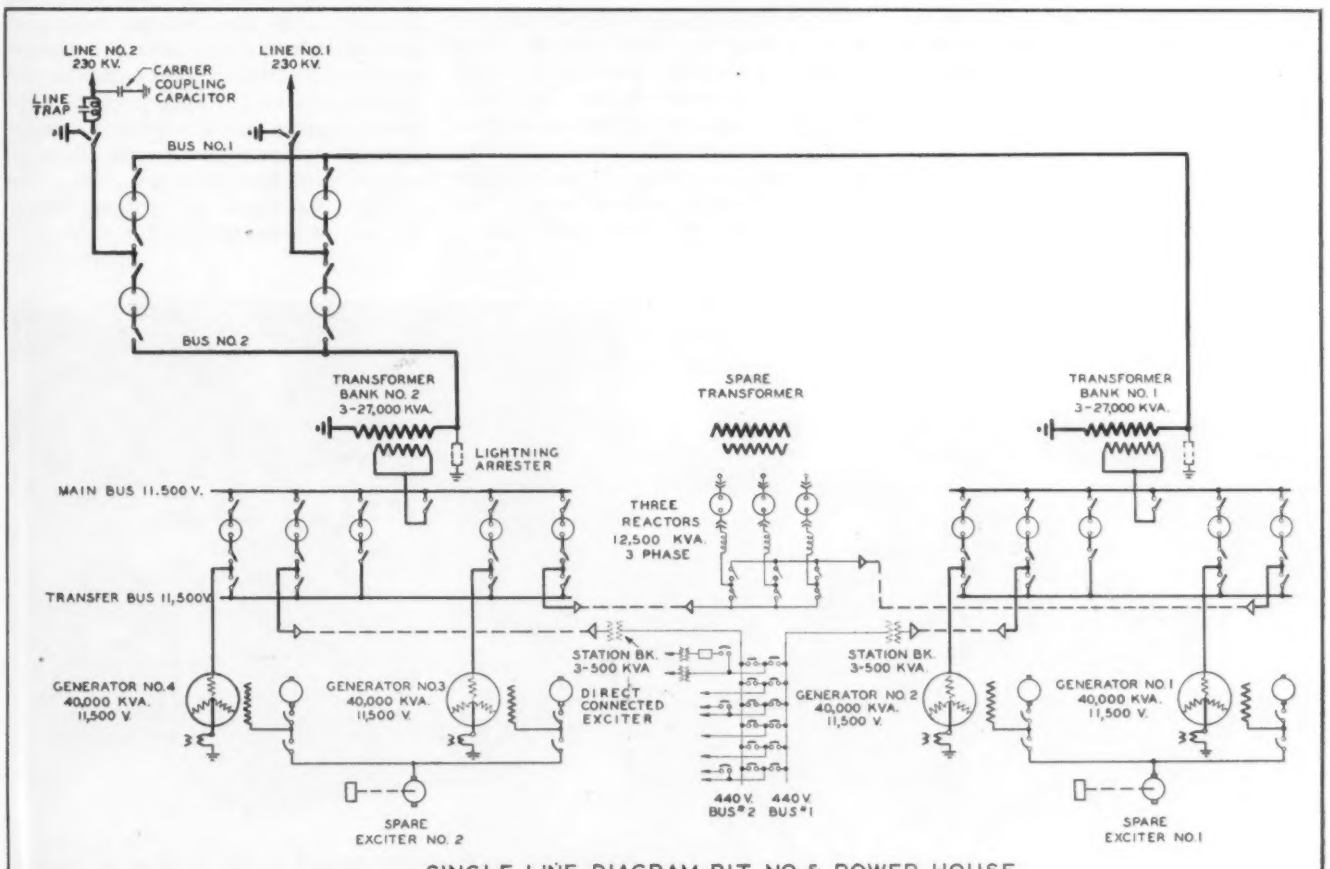
house, the doors and windows were made as tight as possible and a forced-air cleaning, heating and cooling system was provided. Fresh air is drawn from the outside, passed through a self-cleaning filter and discharged into the main areas of the station. The air will be maintained at a slightly positive pressure within the station. After leaving the filter, the air passes through a heat exchanger where it may be either warmed or cooled. Warm water from the generator surface coolers is used for heating and cool water from the tailrace for cooling.

The switchboard room and foreman's office are automatically air conditioned. An additional unit is provided for these areas containing both heating and cooling facilities.

Fluorescent lighting is used in the switchboard room, giving an intensity of 60 foot-candles on the benchboard with the complete absence of glare. Reduced wattage is an assistance when cooling the room by refrigeration.

Turbines

As previously mentioned, the turbines are of the vertical Francis type, rated at 50,000 hp., 300 rpm. They were designed for a flow of 825 cfs., 587-ft. effective head and 630-ft. static head. Ordinarily the scroll case is cast steel, but due to the war no manufacturer was prepared to make the large casting required. Through cooperation of the Allis-Chalmers Mfg. Co. with the Pelton Water Wheel Co., it was possible to obtain the casings fabricated from steel plate. As far as known, this is the first all-welded steel plate casing manufactured for a head this high.



SINGLE LINE DIAGRAM PIT NO. 5 POWER HOUSE

Major Equipment—Pit 5 Power House

Generators	2	40,000 kva., surface cooled, .8 pf., 11,500 volt	General Electric Co.
Generators	2	40,000 kva., surface cooled, .8 pf., 11,500 volt	Westinghouse Electric & Mfg. Co.
Transformers	7	27,000 kva., self cooled, single ph. 11.5/240 kv. with taps	Westinghouse Electric & Mfg. Co.
Transformers, station service	6	500 kva., single ph. dry type 11,500/440 volt	Westinghouse Electric & Mfg. Co.
Reactors	3	12,500 kva., self cooled, 11,500 volt 3 ph	General Electric Co.
Turbines, Francis	4	50,000 hp., 300 rpm., 630 ft. head stetic	Pelton Waterwheel Co.
Butterfly valves	4	102 in., 630 ft. head, hydraulically operated	Joshua Hendy Iron Works
Butterfly valves	4	120 in., 110 ft. head static, hydraulically operated	Pelton Waterwheel Co.
Relief valves, with energy absorber	4	5 ft. dia., 630 ft. head, 950 cfs	Pelton Waterwheel Co.
Lightning arresters	6	220 kv., single ph., Thyrite 16 units per pole	General Electric Co.
Oil circuit breakers	4	Ty. FHKO-339 230 kv., 3 ph., 5 cycle, pneumatic operators	General Electric Co.
Oil circuit breakers	10	11.5 kv., metal clad, Type FH 126, 1,000,000 kva	General Electric Co.
Air break switches	10	230 kv., 3 ph., type P & Ty. TS, 1,200 amp	Pacific Electric & Mfg. Co.
Storage batteries	2	60 cell, FM-11 Exide	Elect. Storage Battery Co.
Charging sets	3	15 kw, 140 volts, diverter pole	Electric Products Co.
Cranes	2	100 ton, 15 ton aux., span 50 ft	Judson
Governors	4	Oil pressure cabinet type (Woodward Gov. Co.)	Pelton Waterwheel Co.
Gates, Diversion dam	4	Wheel type, 50 ft. x 26 ft. 7 in, counterbalanced	Moore Dry Dock Co.
Gate, intake	1	Wheel type, 15 ft. x 19 ft.	Pelton Waterwheel Co.
Emergency power unit	1	Gasoline engine driven generator, 66 hp., 50 kva	King Knight Co.
Switchboard, main	14	Panels, bench and vertical front and rear	General Electric Co.
Switchboard, dc.	5	Panels, vertical	Westinghouse Electric & Mfg. Co.
Station service bus		Cubicles, double bus, metal clad	ITE Circuit Breaker Co.

Major Equipment—Contra Costa Substation

Transformer and auto transformer	3	Type FOAP, 30,000 kva., single ph., 212,500 GRY-11,500 GRY-12,700	General Electric Co.
Transformer, regulating Ty. HT	1	3 ph., 4,000 kva., 12,700 volt exciting 7,040 GRY Series. Reg. 90,000 kva., 115,000 volts.	General Electric Co.
Oil circuit breakers	2	Ty. FG-25, 3 cy., 230/196 kv., 2,500,000 kva. interrupting	General Electric Co.

Major Equipment—Newark Substation

Transformer and auto transformer	3	Ty. FOAP 20,250 kva. 200,000 GRY.-110,000 GRY.-13,200 volts,	General Electric Co.
Synchronous condenser	2	Outdoor air cooled 35,000 kva., O. pf. lead, 17,500 O. pf. lag, 13,800 volts, 1465 amp.	Westinghouse Electric & Mfg. Co.
Oil circuit breaker	1	Ty FHKO-339 8 cy. 230/196 kv., 1,200 amp. 2,500,000 kva. interrupting	General Electric Co.
Oil circuit breaker	1	Ty. RWE-108, 8 cy. 230/196 kv., 1,200 amp. 2,500,000 kva. interrupting	Pacific Electric & Mfg. Co.
Oil circuit breaker	2	Ty. BZO-60, 8 cy. 138 kv., 800 amp. 2,500,000 kva. interrupting	Allis-Chalmers Mfg. Co.

Because of the flexible nature of the water wheel casing, it was not desirable to mount the servo-motors on the casing as is common practice with cast casings. A very satisfactory mounting was worked out in the concrete foundation. The supporting anchorage is located at the horizontal center line of the servo-motors which eliminates all tendency to overturn under stress, a condition which obtains when floor mounting is used.

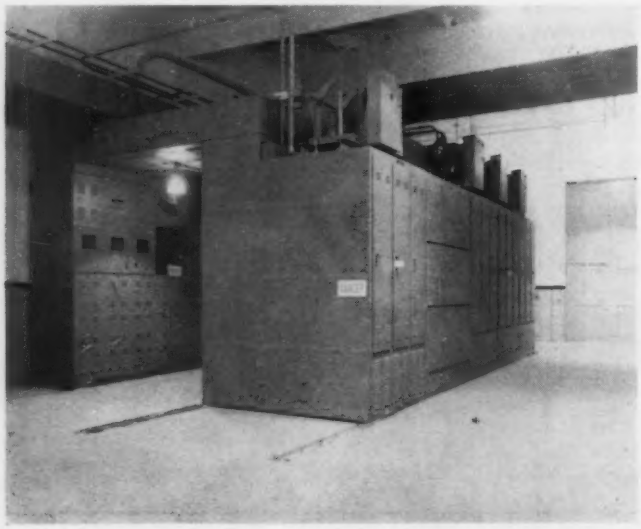
The 100% relief valves are of the differential pressure type designed so that they may be used either as a water saving or water wasting device. They are of the stalling type so that if they should stick or fail to operate the mechanism is sufficiently strong to stall the movement of the servo-motors without breakage.

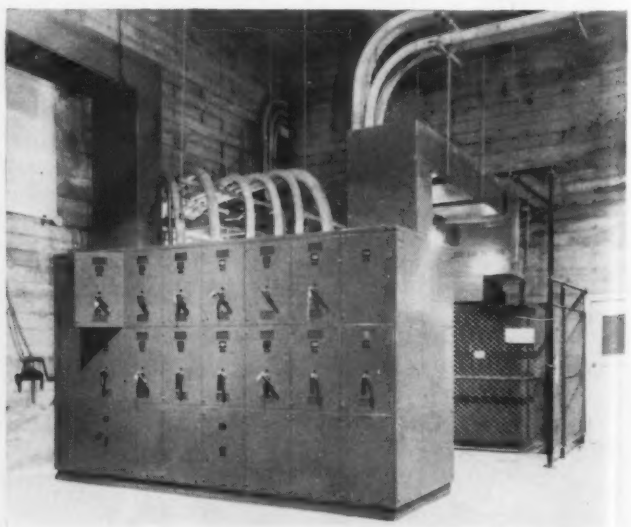
To avoid a dangerous discharge of water across the river from the relief valves, an energy absorber was provided immediately below the valve through which the water must pass. This energy absorber removes a large part of the 50,000-hp. of energy from the water that must be dissipated under maximum discharge conditions.

Governors are of the latest cabinet type actuator with oil pressure tank adjacent to, but separate from the actuator itself. There is a separate complete governor system for each main unit which makes for simplification because of the possible communication of trouble from one governor system to another. The flyball mechanism is electrically driven, receiving its energy from a permanent magnet generator connected directly to the exciter shaft extension of the main unit.

Generator shafts are of forged steel, 24 in. in diameter, with a 6-in. hole

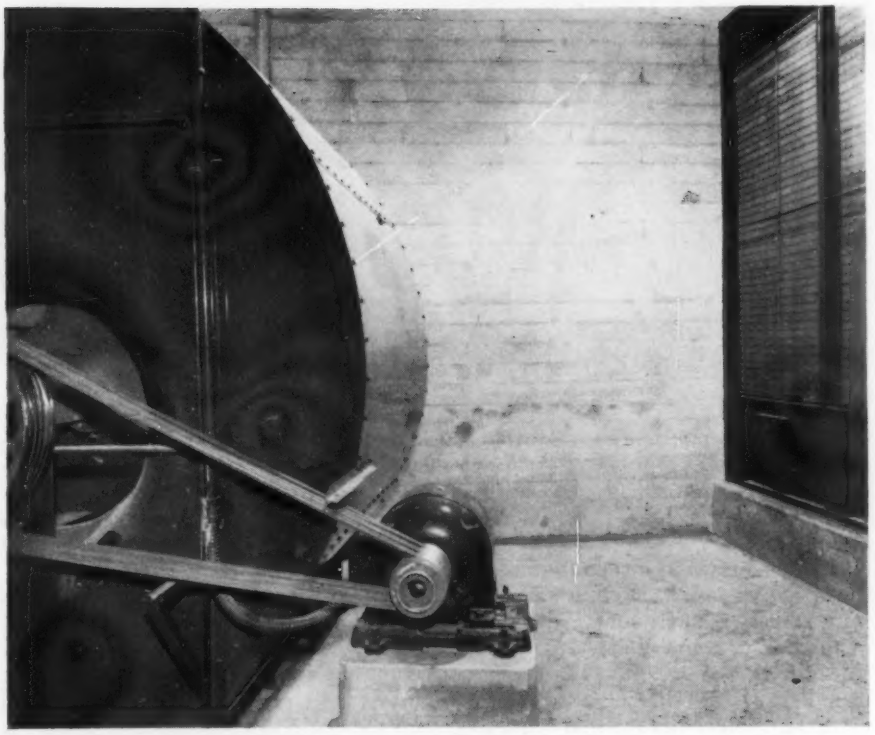
Each 11.5-kv. bus consisting of one main and one transfer bus, and oil circuit breaker group is of standard metal cubicle construction. Bus sections may not be paralleled





Auxiliary power cubicles permit station service to be supplied from either 11.5-kv. bus or the load divided, but interlocked to prevent paralleling of the 11.5-kv. buses

Blower unit (left) and self-cleaning air filter (right) reduce maintenance by supplying clean air to power house



bored through the center of the shaft the full length. The purpose of this is for lowering the turbine runner by means of a cable.

The thrust bearings are designed for a total downward thrust load of 250,000 lb. The two Westinghouse machines are equipped with Kingsbury type bearings and the two General Electric machines with G-E spring-mounted thrust bearings (of a somewhat similar type). The three generator bearings, two guide bearings and thrust bearing of each unit are self-lubricated, water cooled.

Transformers

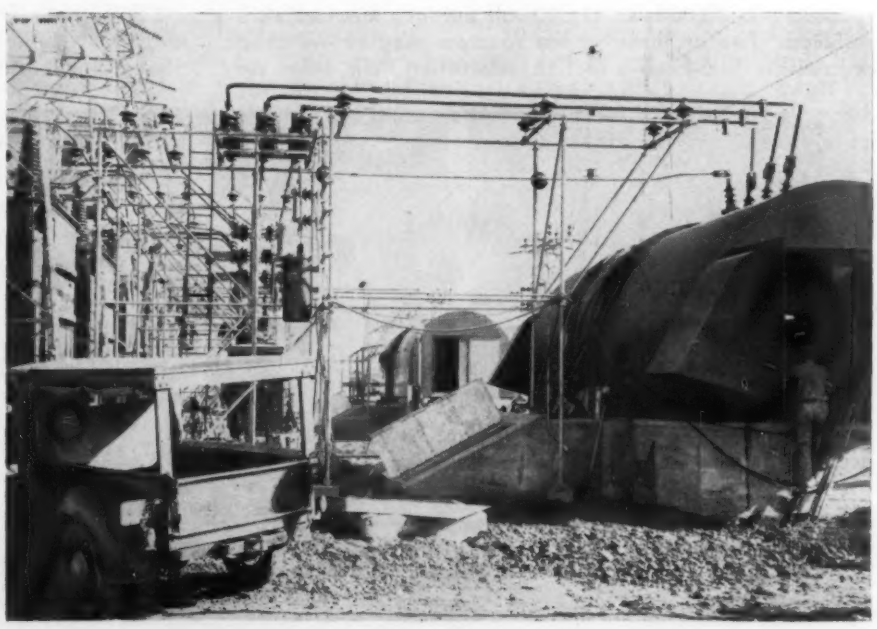
There are two banks of three transformers each and one spare, which step up the generator voltage from 11,500 volts to 240,000 volts, Y. They are single-phase units rated at 27,000 kva., self-cooled with inert air (treating) equipment. Self-cooled units were chosen, even though there is plenty of cooling water at a hydro station, because it was felt that the modern inert air transformer filled under vacuum will have greater life than the water-cooled type where the oil may occasionally have to be disturbed because of maintenance on the water piping system. Experience of this company shows a life of from 15 to 20 years for water-cooling systems, after which they may spring a leak with possible disastrous results. An operating life of 30 to 40 years is expected of the self-cooled transformers used before repairs are necessary. This would fully justify the additional expense of this type of transformer.

Transmission

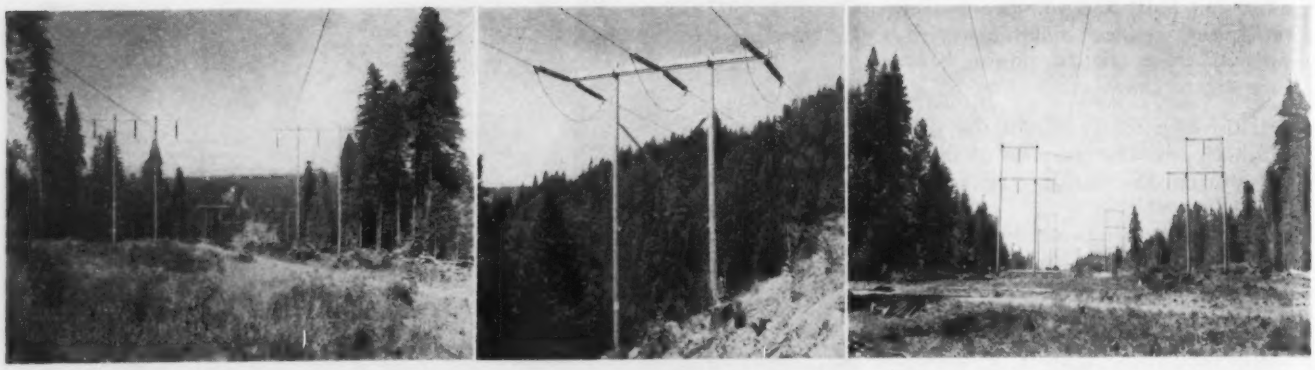
When a new hydro plant is installed approximately 260 miles from the proposed delivery point for the power, there is generally a substantial amount of transmission line involved. In the case of Pit 5 power, one circuit of 230-kv. line of this length would cost approximately $6,000,000. Instead of this, the war emergency cut new transmission to the minimum and required that existing lines be utilized insofar as possible, thus reducing the first cost about 85%. The loading, or rather overloading, of these existing lines is quite a departure from the usual operating practice and will necessitate additional line construction as soon as the present emergency is relieved.

The proposed and existing 230-kv. lines for Pit 5 power consist of two new circuits from the plant, a distance of 14.2 miles, to a connection with the two 230-kv. lines from Pit 1 and 3 plants. From this point these lines will be used for 176 miles through Shasta sub to Vaca-Dixon substation, then over an existing circuit to Contra Costa substation and on to Mocho Junction, 48.6 miles, thence over an existing circuit 18 miles to Newark substation, a total distance of 257 miles.

The two new lines from the plant to the junction with the original Pit lines consist of two 230-kv. circuits on wood pole construction similar to the 55 miles of 230-kv. line which has been operating for about 24 years between Pit 1 power house and Cottonwood substation. The straight line structures consist of two poles set 17 ft. apart, with an 8-in. by 12-in. by 36-ft. cross-arm bolted to the poles near the tops, and were designed for 500,000-cm. copper conductor under California heavy loading conditions. There is nothing particularly new about 230-kv. wood pole lines, although they are much discussed of late; but the loads carried with this voltage usually justify steel tower construction to prevent major failures in the structures themselves due to grass or forest fires, lightning, conductor failures and



Overhead 12-kv. connection to 35,000-kva. synchronous condensers eliminated underground cable trouble in absorbing Pit 5 power at Newark substation



Typical construction used on 220-kv. wood pole tap line to plant. Left: Tangent section straight suspension. Center: Cross-braced deadend structure. Right: Simple method of making transpositions. Similar type used in 1923

other trouble of a similar nature.

Additional capacity was required at several substations preparatory to absorbing Pit 5 power into the PG and E system. A 90,000-kva. bank of transformers and two 220-kv., three-cycle breakers were installed at Contra Costa substation located in the Pittsburg area at the extreme northerly end of the San Joaquin Valley. At Newark substation, two 60,000-kva. transformer banks were installed as well as a 220-kv. bus, oil circuit breakers and two 35,000-kva. synchronous condensers. A feature of the condenser installation is the use of overhead 13.8-kv. bus from the transformers to condenser terminals to eliminate all underground cables and their attendant possibilities of trouble.

To provide suitable electrical protection to the 220-kv. circuit between Contra Costa and Newark substations a carrier controlled relay scheme has been selected. Single wire capacitor coupling is used at each end of the line with transmitter-receiver installed at the capacitor. Frequency range is 50-150 kc. and the output 515 watts. Wave traps are used, rated at 800 amp., 50-150 kc. tuning range, single frequency.

The essential relays used are three three-zone impedance relays, one high-speed carrier controlled directional ground relay, one directional overcurrent backup ground relay and one carrier current control auxiliary relay.

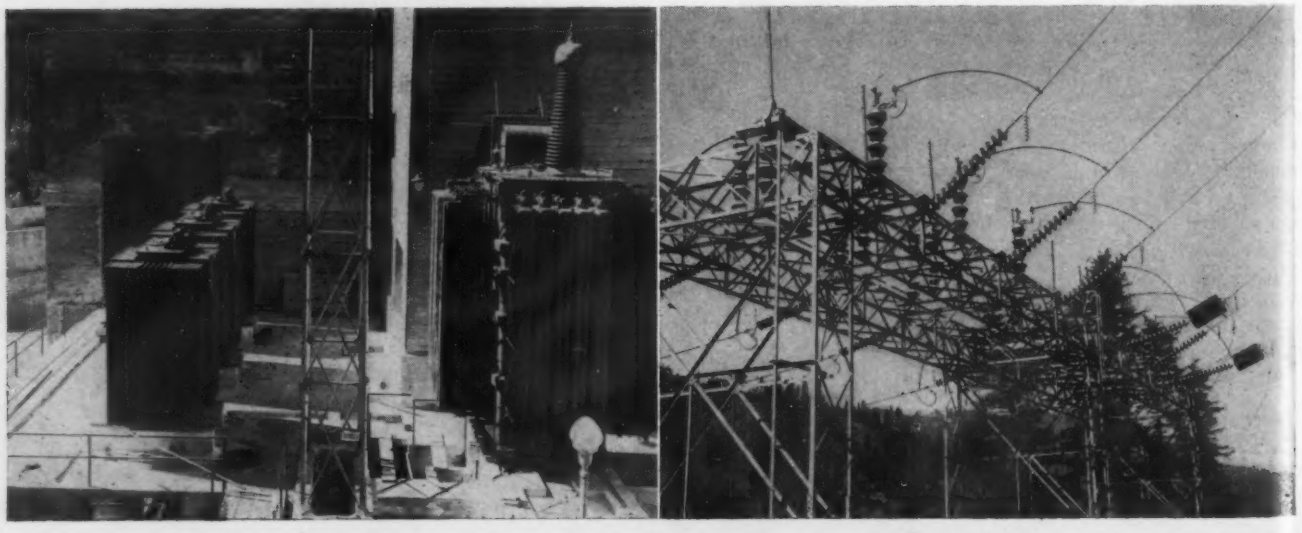
Communication

Telephone communication will be established between the load dispatcher's office in Oakland and Pit 5 power house by means of carrier current equipment. Two channels will be used, one being applied to the 220-kv. circuit between Pit 5 and Contra Costa and a second channel on one of the 100-kv. circuits of the Big Bend lines between Contra Costa and station X in Oakland. The two carrier circuits will be audio coupled at Contra Costa for direct use.

Two-frequency or duplex carrier was adopted for these channels in order to provide a more convenient telephone conversation than is afforded by the single-frequency type used on the existing carrier equipment.

Because of war conditions synchronous condensers were not available for the receiving end of the Pit 230-kv. transmission line. Some other means of supplying charging current for the 300 miles of line, which was slightly in excess of that to be expected from two of the 40,000-kva. generators, with zero field, had to be found. Charging the line under these conditions would result in self-excitation of the generators and produce an uncontrollable rise in voltage. To permit a reasonable amount of field excitation and to reduce the amount of line charging current required of the machines, 3-12,500-kva., 11,500-volt outdoor reactors were installed. Two or three of the reactors may be switched onto either 11.5-kv. bus section, permitting their other use

Where line wires take off from a bus structure at a vertical angle, as they do at the Pit 5 switch structure, the rise and fall of the line wire due to temperature changes transmits movement to the jumper wire and may loosen or break post insulators. To obviate this difficulty, Pacific Electric Mfg. Co. designed the hinged connection shown on the 230-kv. post insulator. The circular jumper on the hinged connection provides a current path between the longer jumper and the conductor attachment on the post insulator. Besides details of this construction there is shown also the 2-230-kv. radio frequency filters in two line wires of the far circuit. These are used in connection with the carrier telephone circuit between Pit 5 and Contra Costa substation



Electronics at Work In Industry—VI

Electronic high-frequency heating, both induction and dielectric are new tools offering great promise. Broadcast transmitter type apparatus used

E. W. Morris
Westinghouse Electric & Mfg. Co.,
Los Angeles

ELECTRONICS has developed with a rapidity which only it could have attained during wartime acceleration. We have, in three years, accomplished in establishing new principles in electronics what normally would have required twenty years. Many of these developments are still secret, and their promises for applications to peacetime needs will have to remain in the laboratory until that day arrives.

Regardless of secrecy, there is one recent development whose peacetime application can be told, that of induction and dielectric heating by high frequency. Although the principles of induction and dielectric heating were known prior to 1941, it was the wartime demand for maximum production that accounted for such applications as reflowing thin layers of tin on sheet steel and drying plywood in minutes instead of hours.

Before describing the equipment it would be well to review the two types of high frequency heating — that is *induction*, and *dielectric*.

Induction heating, familiar to all power engineers, is the generation of heat in conductive materials. Alternating-current applied to an inductor coil adjacent to conductive material induces eddy currents which heat it. The depth of penetration depends upon the frequency and, at the high frequencies used, the heat is generated almost entirely in the surface layer.

Dielectric heating differs from induction heating in that it has the ability to create heat within non-conducting materials, such as plastics, ceramics and wood. Heating is obtained because of the loss factor of the material, and it is interesting to note that heating is uniform throughout in homogeneous material of uniform cross-section. Its usual application is for drying, and it is to be contrasted with ordinary methods because it dries from the inside of the material. In the drying of materials such as wood, this tends to reduce warping and splitting.

In dielectric heating, the material is placed between two conducting plates and a high-frequency alternating voltage is applied between them as shown in Fig. 1. Frequencies vary from two million to more than thirty million cycles per second. Heat is caused by the power loss across the material. The cause of this loss is due both to the actual current flow through the material because of the potential gradient existing across it, and to the dielectric hysteresis which corresponds somewhat to the hysteresis found in magnetic materials. Just as in an electric machine, the ratio of total loss to the total impressed volt-amperes is known as the power factor of the material. The losses are not necessarily directly proportional to the frequency at any fixed voltage, as in many materials the power factor may vary with frequency.

If the material to be heated as a dielectric is regular in shape, such as a flat piece of plywood, the total capacitance can be calculated and the amount of energy computed with a fair degree of accuracy. If the parallel plates can be clamped down against the dielectric material to be heated, the power absorbed by the dielectric is $P = 1.4 \times 10^{12} \times fe\ V^2$ watts per cubic inch.

f = frequency in cycles per second
e = loss factor of the material
V = rms voltage gradient in volts per inch.

The loss factors have been established for many of the materials classed as dielectrics, usually falling between .02 and .07, but sometimes being as high as .70. The usual rms. voltage between plates for short spacings is 2 or 3 kv. This determines the frequency which must be used to create sufficient power loss to dry out or heat the given volume of material.

High-frequency heating of dielectrics already has proved itself in two major applications; that is, drying of regular shapes such as flat plywood sections and, second, the preheating of both regular and irregular plastic sections prior to molding operations.

In induction heating, as shown in Fig. 2, the part to be heated is placed within, or adjacent to, an inductor coil which carries the high-frequency current. A magnetic field is produced, which induces a current in the surface of the part, by a process quite similar to that which induces heat in the laminations of a motor or transformer. Eddy currents are induced within the part and the heat is the result of these currents flowing through the resistance of the material. These eddy currents flow in closed loops in the same plane as the coil currents and thus the heat can be concentrated in any desired

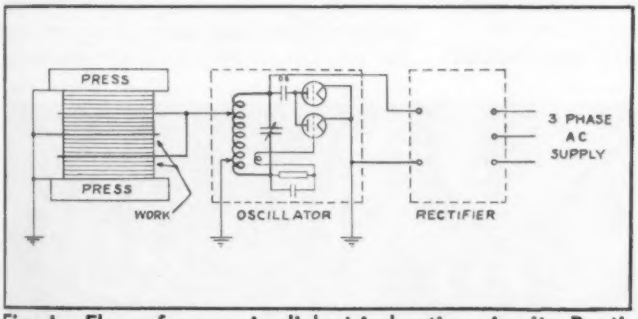
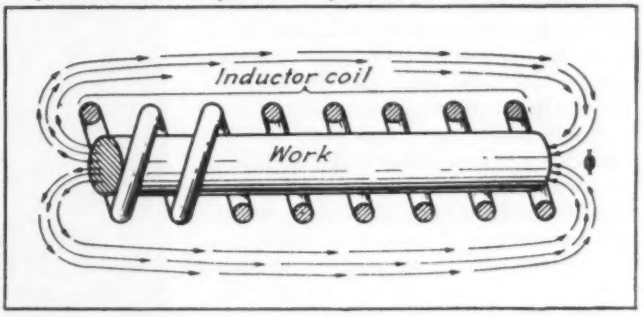
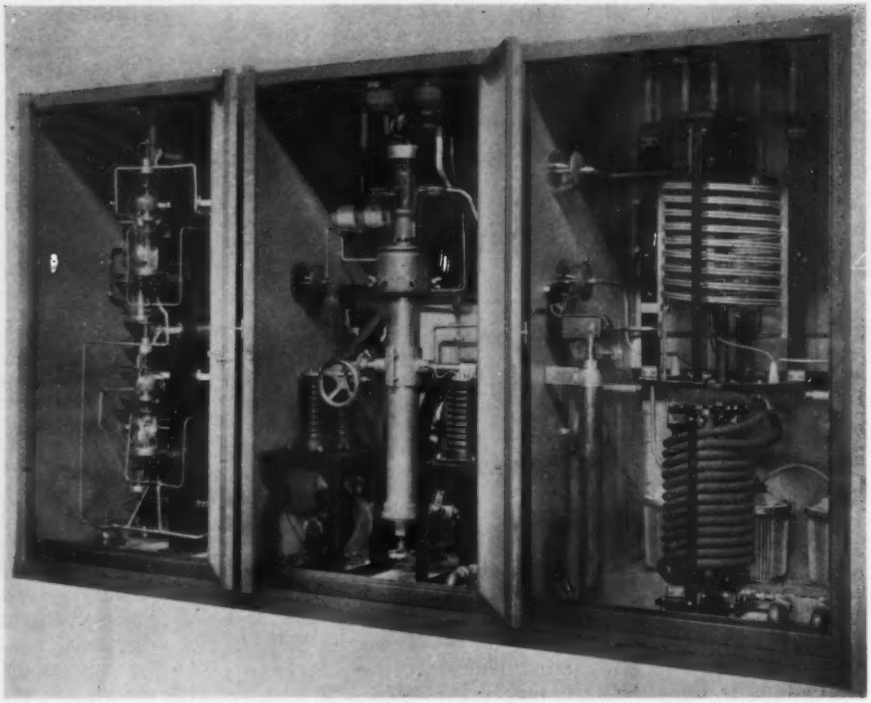


Fig. 1—Flow of power in dielectric heating circuit. Rectified d-c is fed to oscillator which supplies high-frequency a-c to the work. The work is held in a press and forms in effect the dielectric between the plates of a capacitor

Fig. 2—Typical arrangement of coil and work in induction heating. If work is flat, the coils will be external on either or both sides of the work. This type of heating is applicable only to metals. Eddy currents produce the heat in the work





110-kw., 200,000-cycle high-frequency generator for induction heating. Rectifier (left), oscillator (center) and oscillator circuit (right) are shown

surface of the part. Frequencies from 60 to 500,000 cycles are generally used in induction heating. The lower the frequency, the greater is the depth of penetration. Thus, for surface heating, the higher frequencies are used. Frquencies below 10,000 cycles usually are supplied by motor-generator sets, while electronic high-frequency generators are used from 100,000 up to five million cycles.

Applications of induction heating include surface hardening, welding, upset forging and other miscellaneous heating such as chemical vats where an inductor coil provides safety as compared with open flames. A wide range of temperature is possible, reaching as high as 3,600°C.

An outstanding example of the growth of this industrial electronic activity is the application to the reflowing of thin layers of tin on sheet steel. By this process, tin is deposited electrolytically on the sheet steel at one-third the thickness required in former processes. It is then reflowed to form a bright nonporous surface by heat from an induction coil, which is energized by an electronic high-frequency generator. These generators resemble oscillators used in radio. As an example of the growth of this electronic activity, within two years since the first commercial application was made, there have been installed electronic generators for tin reflowing equivalent to two and one-half times the combined capacity of all radio broadcast transmitters in the United States.

Tin may be reflowed electronically at speeds of 1,000 fpm., about five times faster than formerly from a radient furnace. The electronic generator of high frequencies for induction heating is actually a variation of the high power radio broadcast transmitter, which already has been developed to a high state of dependability. This generator for a 1,000 fpm. tin reflow line has an output of about 1,200 kw., which is many times the rating of the large 50-kw. radio broadcast transmitters.

The illustration in Fig. 3 is a typical high-frequency induction heating generator. The circuit usually consists of a six-tube, three-phase full wave rectifier and a two-tube oscillator, all of which may be operated from 220- or 440-volt power supply. Equipments have been standardized with output ratings of 2, 5, 10, 20, 50 and 100 kw., with frequencies ranging from 450 kilocycles to 30 megacycles. Power input is approximately double the r.f. output, depending upon distance and the characteristics of the material.

Production of plastic parts in presses like these can be materially increased by application of dielectric heat within the material which speeds up polymerization of the thermosetting resins

Farm Power

Survey shows trends in California Agriculture

THE IMPORTANCE of mechanical farm power in California agriculture and the attendant difficulties in securing repairs and replacements for such power during the war emergency, created a need for detailed data on the present status of such power on farms of the state. Accordingly a cooperative project was arranged between the California State Bureau of Agricultural Education and the Division of Agricultural Engineering of the University of California, whereby a field survey would be made of typical farms in the various agricultural counties of the state to determine the extent, condition and types of mechanical farm power in use.

A total of 648 farms was surveyed with data tabulated on forms prepared by the Division of Agricultural Engineering. Data were obtained from 35 counties and the samples are held to be sufficiently typical to show power trends in California agriculture. In general the farms covered by the survey are somewhat larger than the average for the state. The average farming experience of the operators was 21.0 years. Ninety per cent of the farms employed seasonal labor ranging from 1 to 300 persons.

Data were developed on tractors, gas engines, electric motors, trucks, automobiles and horses. Of particular interest to the electric industry are the figures covering motors and their application. The following material extracted from the report covers that subject.

Six hundred forty-seven farms were included in the electric power survey. Of these 588, or approximately 91%, were served by electric power and 59, or 9%, were without electric service.

Number of electric motors—A total of 2.586 motors was reported on the 588 farms using electricity.

Uses of farm electric motors—Table I shows the number and description of the uses of motors on the farms surveyed listed in the order of frequency of use.

Motor sizes—The sizes of motors used ranged from fractional up to 80 hp. with irrigation pumps responsible for the largest electrical demand. The 2,586 motors have a connected electrical load of 7,863 hp., which is equivalent to approximately 13.4 hp. per farm served, or 12.2 hp. per farm surveyed. The distribution of electric motors by sizes is shown in Table II.

New and used motors—Of the 2.586 motors reported 2,091, or approximately 81%, were purchased new and 495, or approximately 19%, were secured as second-hand motors. The ratio of new to second-hand motors increases slightly in the more recent years.

Total motors on California farms—An analysis was made of 68 farms in two farm size brackets of 50 to 99 acres and 220 to 279 acres respectively to study the relationship of electric motor service to farm size. These data are not extensive enough to show more than trends but they are recorded in Table III.

These data indicate that fractional motors, used largely in the home do not vary greatly per farm unit but the variation in number of motors ½ hp. and over may vary greatly, since these larger motors used for crop handling, milking, processing, and irrigation are more directly related to farm size. Table IV has been prepared to show factors applying to all farm sizes listed by the U. S. Census and from these ratios computations of total motors on California farms have been made.

Table I—Uses of Electric Motors on 588 Farms

Order of Importance In Use	Use	Number Reported
1	Refrigerators	444
2	Irrigation pumps	403
3	Washing machines	380
4	Domestic pumps	376
5	Milking machines	155
6	Portable motor use	125
7	Shop motors	120
8	Mixers	88
9	Sweepers	67
10	Fans	45
11	Incubator motors	39
12	Milk coolers	38
13	Motor use not given	26
14	Food grinders	26
15	Cream separators	24
16	Feed grinders	24
17	House coolers	23
18	Ironers	21
19	Sewing machines	18
20	Dehydrator motors	18
21	Walnut hullers	15
22	Wood saws	13
23	Air compressors	13
24	Elevators	11
25	Furnace motors	10
26	Food mixers	6
27	Sump pumps	6
28	Blowers	5
29	Brooder fans	5
30	Potato graders	4
31	Lawn mowers	4
32	Paint sprayers	3
33	Sheep shearers	3
34	Feed chopper	3
35	Sorting tables	2
36	Centrifugals	2
37	Cement mixers	2
38	Oil pumps	2
39	Bottling machines	2
40	Bottle washers	2
41	Prune shaker	1
42	Hedge clipper	1
43	Sack cleaner	1
44	Floor waxer	1
45	Dishwasher	1
46	Fruit juicer	1
47	Vacuum pump	1
48	Dipper	1
49	Bean cleaner	1
50	Sacker	1
51	Milk pump	1
52	Churn	1
53	Pasteurizer	1
	TOTAL	2,586

Table II—Distribution of Electric Motors by Sizes

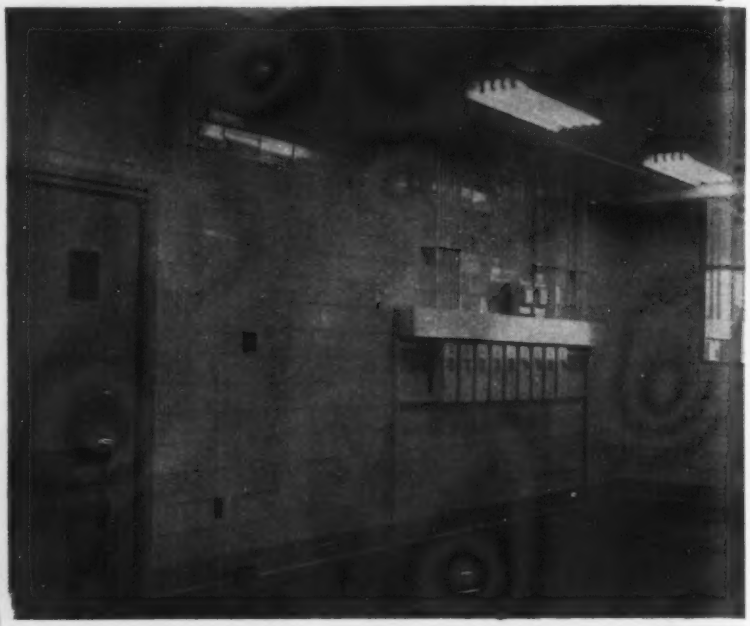
Motor Sizes in Hp.	Number of Motors	Connected Hp.
Under ½	1,559	260
½	184	92
¾	54	40
1	149	149
1½	49	73
2	85	170
3	73	219
5	65	325
7½	38	285
10	83	830
15	92	1,380
20	90	1,800
25	14	350
30	24	720
35	8	280
40	9	360
50	5	250
60	2	120
80	2	160
Total	2,586	7,863

Table III—Relation of Electric Motor Use to Farm Size

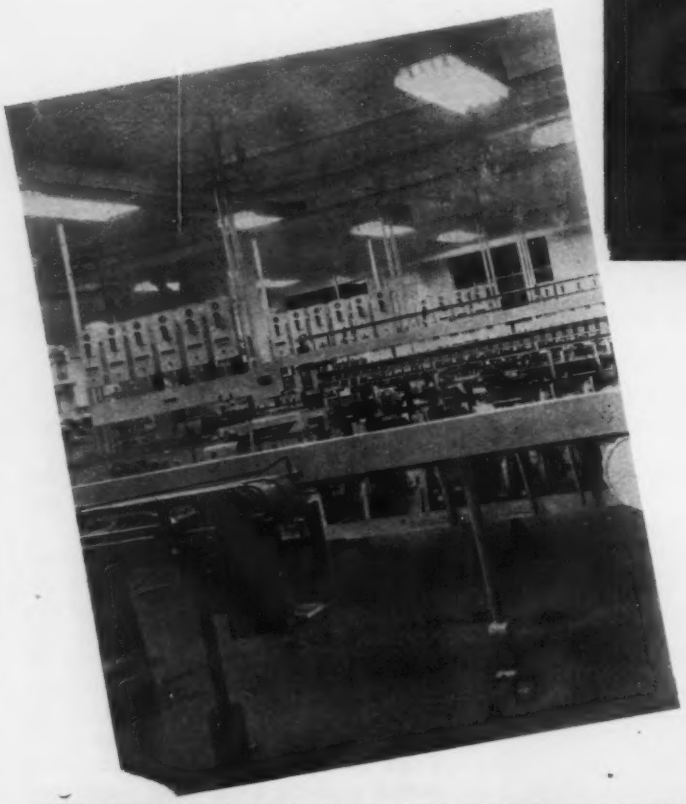
Items	Farm Size 50-99 Acres	Farm Size 220-379 Acres	All Farms
Number Farms	68	68	647
Total Motors Under ½ hp.	203	202	1,559
Total Motors ½ hp. and Over	106	163	1,027
Ratio Fractional Motors/Farms	2.99	2.97	2.45
Ratio Motors ½ hp. and Over/Farms	1.56	2.40	1.58

Table IV—Estimate of Electric Motors on All California Farms

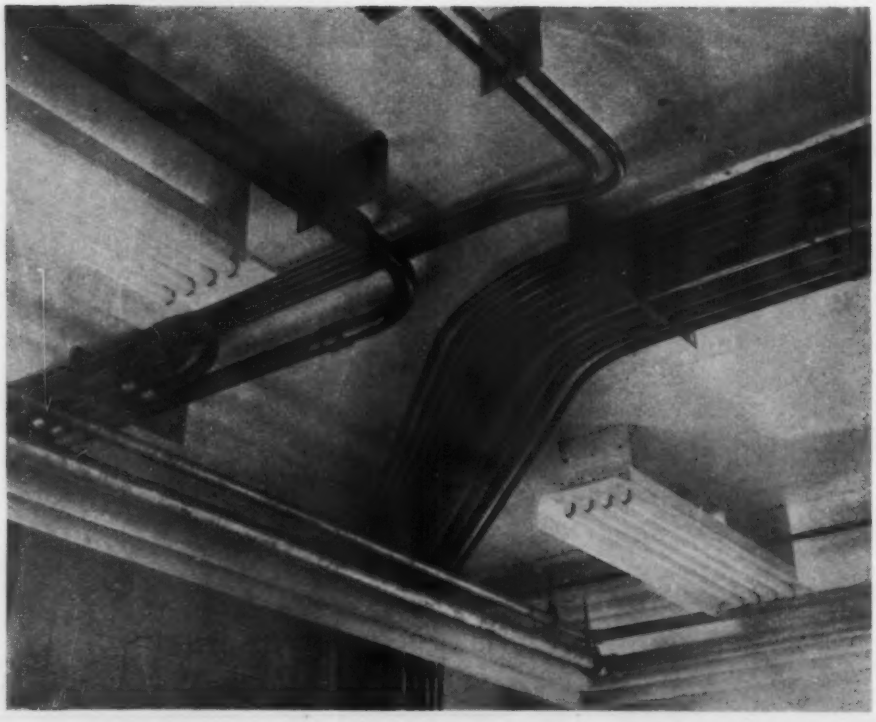
Farm Sizes In Acres	No. of Farms	Motor Factors Less Than ½ hp.	Motor Factors ½ hp. and Over	Approximate No. Motors Less Than ½ hp.	Approximate No. Motors ½ hp. and Over
Less than 3	6,476	2.0	.50	12,950	3,230
3 to 9	25,070	2.08	.60	52,000	15,100
10 to 29	37,826	2.16	.72	81,600	27,150
30 to 49	16,641	2.24	.84	37,300	14,000
50 to 69	7,138	2.32	.98	16,500	7,000
70 to 99	8,602	2.40	1.15	20,600	9,900
100 to 139	5,334	2.48	1.30	13,200	6,920
140 to 179	5,335	2.56	1.48	13,600	7,900
180 to 219	2,541	2.64	1.66	6,700	4,390
220 to 259	1,921	2.72	1.86	5,240	3,580
260 to 379	4,226	2.80	2.06	11,800	8,450
380 to 499	2,272	2.88	2.20	6,540	5,000
500 to 699	2,534	2.96	2.40	7,500	6,070
700 to 999	2,017	3.04	2.60	6,170	5,650
1000 and over	5,265	3.12	2.80	18,400	14,700
Totals	133,198			310,100	139,020



Mounted away from the wall to permit cleaning and prevent accumulation of bacteria, the motor control panel in the Parkay department, shown at right, was mounted on angle iron supports. Below, starters for conveyor belt motors mounted on special panels suspended on pipe from the ceiling, adjacent to each conveyor line, fed by conduit from above into the gutter at the base of the starters



Conduit and fluorescent fixtures supported on sheet metal brackets are shown below



Craftmanship for

Especial care taken in food plant conditions which would harbor the

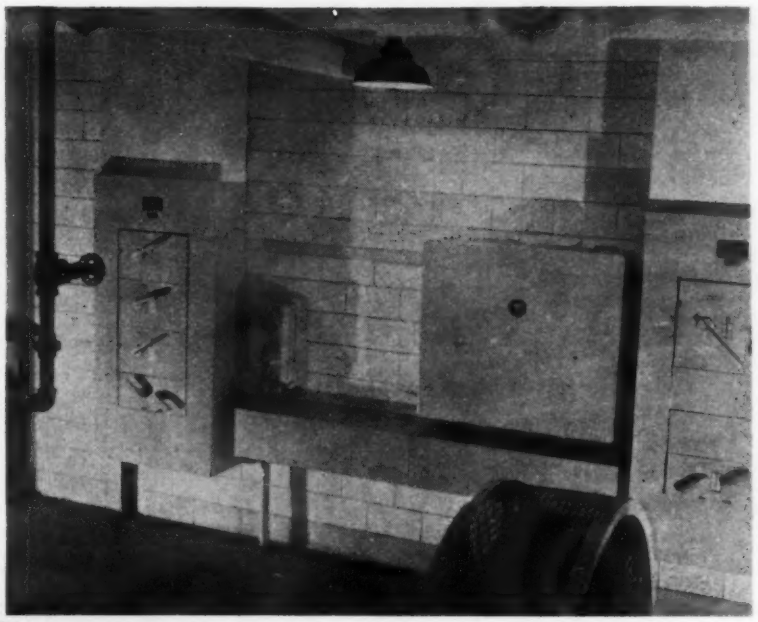
IN contrast to the all too familiar rushed, skimped, pressured job, once in awhile a contractor has the opportunity to put real care, skill, craftsmanship and thought into an installation and still not make it cost more in long-time results. Such a job is that which Stolper Electric Co. of Burbank has been doing for the Kraft Cheese Co. in Los Angeles under the supervision of Harve McMurry, electrical engineer for Kraft, from Chicago headquarters.

A two-story and basement industrial building, about 60x120 ft., it houses the mayonnaise, French dressing and Parkay making and packaging facilities of the company in southern California. But, because it is a high-grade food plant, extra care was taken to minimize all possible conditions which would harbor bacteria. Instead of a typical electrical installation, therefore, several of the details were designed especially to serve this particular purpose.

The panels for lighting and motor switches, for example, are neat made-up assemblies, mounted on 1½x1½-in. angle iron frame, away from the wall against which they are placed. This permits access to the rear for cleaning and makes no pockets which would harbor bacteria.

All pipe is neatly racked and bends are made with uniform radius and so

Close-up of the control panel for the refrigeration system (1), which is shown (2) in respect to the motors and compressors. Feeders cannot be seen, but they come in overhead into the two panels through vertical troughing above each and the same width as the panel. This panel serves the two 40-hp. motors shown in (2) and a 60-hp. motor not shown. The main switchboard for the plant is seen in (3) below, half of which is for lights, half for power. It contains a 1,600-amp. I-T-E air circuit breaker as a power main switch and a 600-amp. breaker for the lighting main. The board was built by Mullenbach, using BullDog switches and I-T-E breakers. Ample space was left on both sides to care for future additions to the load



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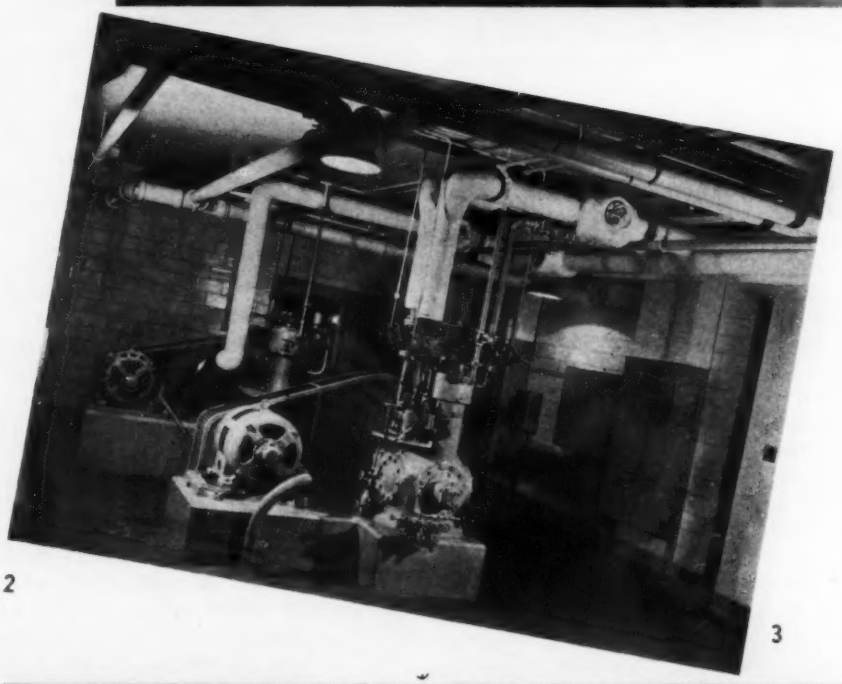

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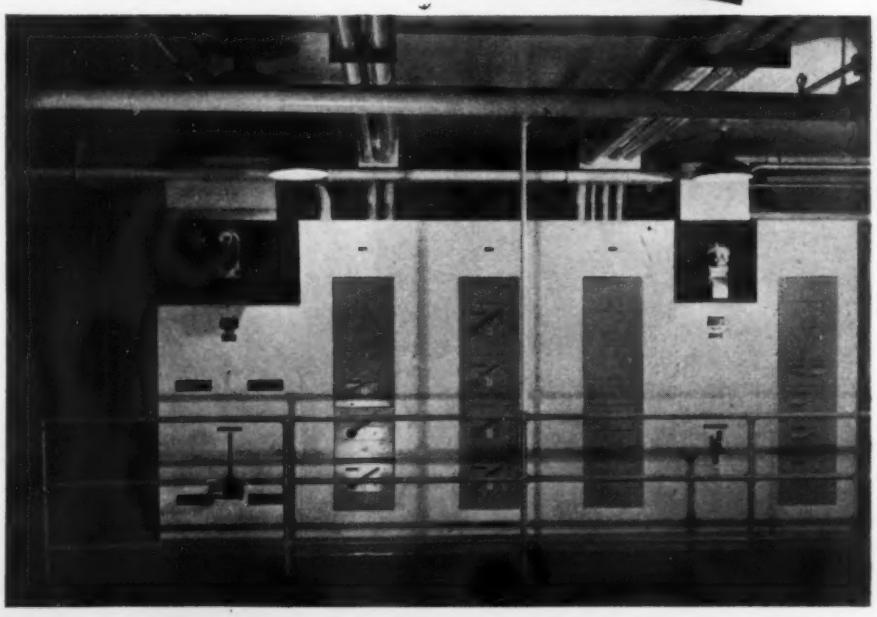


Kraft Plant

installation to prevent breeding of bacteria

cut as to bring all pipe nipples in line. The large pipes in each group were bent by the contractor first and the others made to conform.

Supports for pipe from the ceiling are not the customary pipe straps or hangers. Instead plates of No. 10 gauge steel were drilled for the pipes they support and bent at a right angle for bolting to the ceiling. The illustrations show these supports. It will be seen that similar sheet metal supports are used to hang the fluorescent four-lamp, 40-watt F. Lumidor industrial fixtures from the ceiling.

Controls for the conveyor lines are all Allen-Bradley combination switch and magnetic starter individual cabinet switches. These were mounted on a short piece of gutter suspended from the ceiling on $1\frac{1}{4}$-in pipes. The conduit serving them comes in from overhead and loops down to each group of switches.

Push button controls are mounted in several places on the conveyor lines, the control runs being placed in conduit under the conveyor and thus inconspicuous. In several places remote control push buttons are suspended from a ceiling box in one room where the motor to be controlled from it may be at the other end of a conveyor in another room.

Main service comes in from the Bureau of Power & Light mains, from a

transformer bank on a pole outside, down to the basement in 3-in. conduit. in multiples of three 500,000-cir. mil. cables in order to get maximum capacity with least reactance loss. The main power switch is a 1,600-amp. I-T-E air circuit breaker; the main lighting switch a 600-amp. breaker. These are mounted at both ends of a Mullenbach main switchboard, equipped with BullDog distribution switches. Feeders from this main board are taken out overhead to sub-panels, of which the refrigeration panel illustrated here is typical.

Many niceties of control were worked out by the contractor and the engineer. For instance, in a capping machine a microswitch was used to shut down the machine should one of the caps fail to have its treated paper lining in it. The microswitch was set for the thickness of the paper liner. When it is not present the switch cuts the current through relays.

Electrical work was supervised by Roy Schlueter, foreman for Stolper Electric. Ray Stolper also lived with the job. Schlueter remained with Kraft to become maintenance engineer upon its completion.

Having learned that he was to do this job in sufficient time, Ray Stolper was able to anticipate most of the major equipment needs and to order in advance of priority restrictions. Thus he was able to proceed as required and to have materials on hand when needed.

Abolish No. 14? That's Not the Answer

Much more could be accomplished by raising voltages and frequencies to improve efficiencies, reduce metal weights, utilize new ideas

John M. O'Dwyer
U. S. Bureau of Reclamation, Denver

RECENT savage attacks on an old friend cannot be passed over in silence by one who has for years heaped profanity on electrical manufacturers while wrapping No. 10 and No. 12 wires around terminal screws more suited to the embrace of No. 14 or smaller.

The war now raging has shown clearly the folly of our previous waste of natural resources. If the war does not give us a lasting realization that economy is good engineering, we should be better off under a conquerer who would make us get along with less, and keep quiet if we did not like it.

Regardless of what we call our motives, patriotism or penny pinching, conservation or common sense, we should bend every effort to reducing the amounts of materials required to distribute, safely and efficiently, the output of our generating stations. When a proposal is made to use more of some of the most vital materials, copper and insulation, it is time to examine our electrical distribution practices. The case of No. 14 affords an excellent opportunity to do some straight thinking.

In the first place a 3/64-in. covering of insulation on No. 14 takes only 75% of the material required for No. 12. Again, No. 14 copper wire can, in the future as it has in the past, carry 15 amperes entirely satisfactorily with distance the only limiting factor. It is not probable that any industrial or home circuits should be of such great length that excessive losses could result from the use of No. 14 wire at that loading.

The problem thus becomes: How can we get the most power possible at a maximum of 15 amp.? The obvious answer is: Raise the voltage. That alone, however, is not enough. Let us forget single-phase a-c has ever existed, and think only in terms of three-phase. (Should such a radical procedure leave an aching void in our memories, the said hiatus may be filled by remembering that no divine law has ordained voltages to be divisible by eleven. Integral multiples of 100 volts would save innumerable slide rules, scratch pads, and pencils.) Let us see what happens when the voltage is raised and polyphase equipment used.

At 15 amp., 110 volts, three two-wire circuits are good for a total of 4,950 volt-amperes. At 300 volts the same circuits can supply 13,500 volt-amperes. Now, let us regroup the wires into two three-phase circuits. We find each with a capacity of 7,785 volt-amperes, for a total of 15,575 volt-amperes. So great a gain over present methods makes one wonder if No. 14 should not be scrapped after all and No. 18 substituted. And do not ignore the "volt-amperes" designation of the above figures. Where motors are involved the three-phase installation will permit a far greater power output.

There is no valid excuse for not raising voltages to reasonable values. Today most wiring is run in conduit, or at least in flexible armor, and there is little chance of accidental contact by the user. In California, and probably in other states, portable electrical devices in industry are required to be grounded by means of an extra conductor in the cord and a grounding prong on the attachment plug. The same precaution should be extended to cover home appliances, even at present voltage levels.

Arguments, on safety grounds, against higher voltages are no more valid now than were the same arguments years ago when used against electricity by the carbide and gas companies. Later, when discussing the saving of iron, the feature of safety will again be brought up. For the present let us see how we can save our most important magnetic material, iron.

The change to three-phase would result in a large saving of iron. Other savings can and do come from the development of better steel and improvements in design. Real economy will arrive when the sacred cow, 60 cycles, is chased from the home to the abattoir. Our devotion to 60 cycles is on a par with our enduring love of a weird system of weights and measures, the A. M. and P. M. clock, and an extremely complicated calendar.

An increase of frequency to say three or four hundred cycles would not only cut sharply the size and weight of static and rotating equipment but would make economical the widespread use of the more expensive and efficient magnetic materials now limited to special applications. An incidental but most important benefit of high frequency is the greatly lessened danger of harmful shock.

The recent and older unused discoveries in electronics should make feasible efficient and inexpensive frequency changers to be used to cut over distribution circuits to the higher voltages and frequency. Perhaps the day is not far distant when the same art

will make possible d-c high-voltage transmission, and there will remain no good reason to maintain the present low distribution frequency.

The proposed changes would necessitate the replacement of a vast number of motors, appliances, power outlets, lamps and fixtures, and the rewiring of houses. Since the wiring of even so called modern houses is rapidly being made obsolete by the swift growth of home utilization of electricity, the rewiring is overdue in most cases. It can be done in many instances with an actual reduction in the weight of copper and conduit.

The three-phase lamp would need a new form of socket, but few would regret the passing of the present screw type in favor of a better contact system. A three-phase lamp can give warning of its approaching demise and still give a considerable amount of light when the first phase burns out.

The amazing increase in use of fluorescent lighting indicates that we shall have more efficient lighting in future, regardless of the means of creating it. In minimizing stroboscopic effects and in eliminating step-up transformers, three-phase supply and voltages much higher than the present 110 to 125 would be very beneficial. The higher efficiency of the newer light sources will permit more and better lighting even with present voltages—another reason not to be too hasty in crying for bigger conductors.

It should not be necessary to discuss further the savings in material and labor, and other benefits, such as power factor improvement and lower voltage drop, to be derived from higher voltages and frequency and three-phase service. However, a few words may be said on the subject of house heating with higher frequency current.

To date, the most efficient method of heating buildings electrically is the reversed refrigeration system, but its first cost is high and its field of application limited. The most effective form of house heating has been demonstrated to be by radiation from warm walls, ceilings, and floors with the air relatively cool. Higher frequencies lend themselves admirably to inductive heating. Iron wire with inorganic insulation and encased by light iron tubing could be used to heat radiating surfaces safely and effectively, using a minimum amount of the cheapest available materials. Such devices can be built into the home and should outlast it. Power factor? At high frequency capacitors will come into their own and be a dime a dozen. Before taxes, that is.

It is possible to write ad nauseam on the manifold advantages of higher voltage and frequency. Although it has barely touched on the subject, the foregoing should suffice. If thought can be directed along this line, better minds will evolve better methods and the means to accomplish the desired ends. Probably, however, nothing will be done until the proletariat arises in righteous wrath and strings up utility executives and electrical manufacturers at a rate of sixty per second from the unused crossarm space of single-phase lines.

Since the above was written the president of the Anaconda Copper Mining Co., who certainly should be an authority, has publicly stated that the United States is now almost a "have-not" nation in copper. How about that?

Machine Lighting

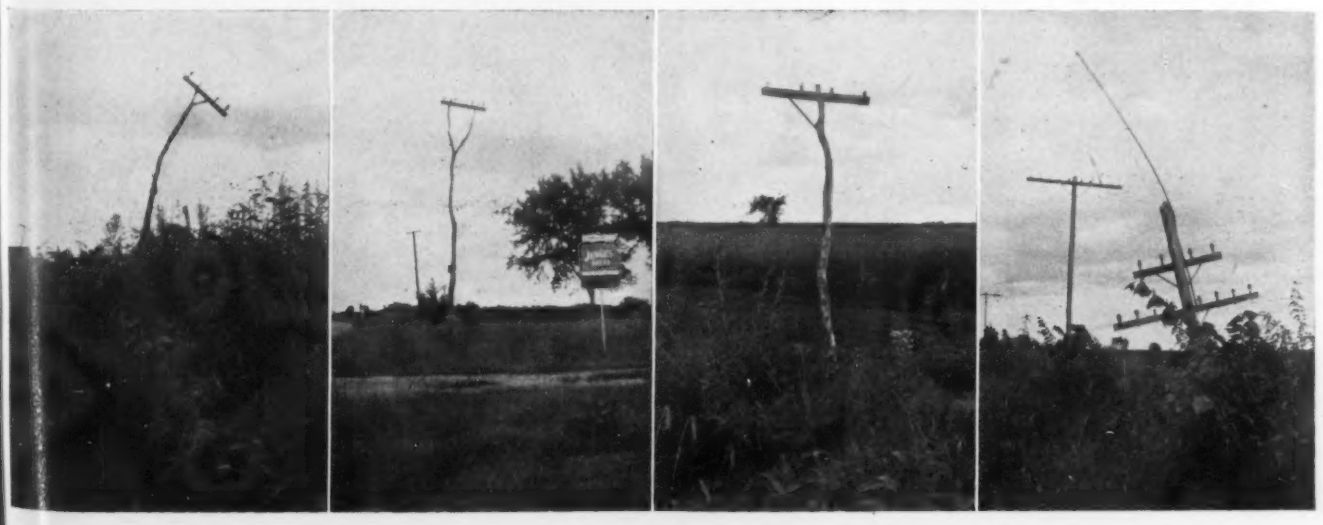
Valuable information for those having lighting problems in war and other industrial plants is contained in the March issue of *Illuminating Engineering*, published by IES. Applying particularly to lighting of metal working operations and plants, the five reports appearing in the magazine were prepared originally for presentation at WPB lighting conferences in Chicago, and are based on investigations conducted by committees representing the Chicago Lighting Institute.

These specialized studies cover lighting of horizontal and vertical spindle machines, sheet metal fabrication, milling machines, spacers and planers, welding. Importance of general lighting, specific recommendations for local lighting, costs and maintenance data are included.

Pictures and diagrams are numerous and aid in understanding the lighting problems presented.

● Street Lighting in Vancouver is now better than it was in prewar days. When the war developed on the Pacific, ARP authorities applied dimout regulations and, as a result, black paint was placed on the top of 7,000 ornamental street lamps. However, to offset the dimout, it was decided to install reflectors under the shields to concentrate more light on the pavement. Now, the black caps have been removed and the lights are back at prewar standards, plus the increased efficiency provided by reflectors, which have been retained. The cost of removing the shields was $2,500 and involved several months work.

Substitutes can go too far or else the contractor took this job too low, thinks C. D. Draucker, Los Angeles contractor, who found and photographed these rare pole line specimens in the middle west. The leaner, at left, evidently is to harmonize with the road curves; takes an expert woodsman to find one. The twin-pole is especially good where positive and negative need separation; very scarce. The low-line, or low-lying pole, averaging eight feet above ground, barely permits cattle to pass under. At right, the highway cross-under, making use of a rusty pipe for a tap



LIGHT for LAYOUT

The Need

Even, shadowless illumination on a large layout and planning table, without reflected glare.

Conditions

Prior to installation lighting over this table was from a suspended single bare 500-watt clear lamp. Intensity ranged from 10 to 40 f-c.

Installed

Light hood, in which were mounted two 500-watt silver bowl lamps on extension sockets.

Results

Increased intensity to 50 f-c. over entire table, removed bare-lamp glare and reflected glare, and likewise improved illumination in the area surrounding the table. Satisfaction with this improvement lead to call back in a month for advice on relighting entire shop.

Who

Pacific Coast Boiler & Tank Co., 235 Main St., San Francisco. Layout by Pacific Gas and Electric Co. lighting consultant.

LIGHT for AUTO REPAIR

Prior Conditions

Spotty lighting from four two-lamp, units, with 100-watt F lamps and local lighting over work benches, giving about 10 f-c.

Installed

In entire floor, 67 units, each two-lamp, 240-watt (two 100-watt F lamp) units. Spacing in work area, 200 ft. across, was to place one unit between each pair of cars and one in front to provide major illumination in hood area. Mounting height about 11 ft. (Picture below indicates lighting under previous arrangement; that at right the entire lighting on.) Walls repainted.

Results

Intensity increased to from 30 to 35 f-c. over entire working area. Improved lighting results in entire shop being kept cleaner by workmen. Previous objections to night-shift work are gone. Work speeded up because of better ability to see.

Who

Les Vogel Chevrolet Co., 50 S. Van Ness Ave., San Francisco. Relighting engineered by Gilbert Trosper, Pacific Gas and Electric Co. Installation by Porter Electric Co.; fixtures by Crescent Electric Supply Co.

The Need

Adequate illumination for repairs to automobiles, working under hoods, etc. with minimum use of portable lamps.

EMEA *Dope Sheet*

Silverplating for Contact Maintenance

Prepared from information furnished by W. A. Hesse, Alameda

WITH electrical equipment working at full load and replacement parts difficult to get, the maintaining of the contact surfaces of current carrying and breaking parts of switches, breakers, contactors, starters, etc. grows in importance. With equipment carrying heavy loads, low resistance at the contacting surfaces on buses and switch blades likewise is desirable. Silverplating of such surfaces has long been a means of improving such contacts because of the high conductivity of silver and its resistance to corrosion.

Where facilities have been available, the silverplating of contact blades, fuse clips, switch blades, spring clips, cable ends and clamps and bus bars where connections are made has been worthwhile. Such plating, however, required dismantling and taking the parts to the plating tank. This necessarily meant keeping the device out of service while the plating was being done or of replacing it with another. In these days such a supply of spares is not always possible to have.

With a portable electroplater, however, the plating can be done right at the equipment and the device returned to service that much sooner. Some plating can be done right at the switchboard if desirable. Less stock of duplicating parts is necessary.

Purpose—The purpose of electroplating with silver is to improve the conductivity of all electrical contacts. This is especially true where contacts have oxydized or become pitted from arcing and hence require resurfacing.

Silver, being resistant to corrosion and oxydation, extends the time that contacts will operate efficiently before requiring care or replacement. Tests also show that contact resistance is materially reduced over a longer period of time and watts loss (which generates heat) is reduced. Equipment can thus be operated at full rating or higher with greater safety and efficiency when contact surfaces are silverplated, an important consideration under heavily loaded war conditions.

Where Usable — Plating can be done with a portable outfit on bus bars, fuse clips, bus bar clamps and connectors, cable ends and clamps, transformer contacts, breaker contacts, right at the installation. In assembling a switchboard, parts can be plated near the board and placed in the job immediately. For maintenance work plating can be done at the work, requiring a minimum shutdown. (Plating for other than electrical uses can also be done with this type of outfit, and with other metals than silver, of course.)

Materials—A portable plating outfit, (such as the Hesse kit) contains a source of direct-current, usually a rectifier. However, a storage battery or a group of dry cells can be used, the latter for small work.

For most maintenance operations a 5-amp. rectifier will suffice. For larger surfaces, such as bus bar, or for plating where two men are each operating, a 10-amp rectifier is more satisfactory.

If a storage battery is used it should be one of two to six volts. Where dry cells are used, at least two to four will be required, and they should be connected in series, preferably soldering the connections for maximum contact.

Wire plating leads should be no longer than necessary and should be identified as to which is to be used for the negative and which the positive lead. Care should be exercised at all times not to allow them to touch and permit a short circuit.

Plating anodes in the Hesse outfit consist of either (1) a flexible shaft, to be used for plating flat, cylindrical or irregular shaped surfaces where a straight shaft would not be convenient to use. (2) a round detachable type for plating small areas, (3) a paddle for use between jaws of disconnect switches, (4) a trowel for plating switch contacts, blades, large surfaces, (5) a rod for plating inside surfaces of receptacle contacts, holes or cavities, and (6) plating brushes for use on cable ends, threads on bolts and irregular surfaces.

Covers for the anodes include a plain cover for flat surfaces, a mop style for irregular surfaces as well as the brush.

Also necessary are enameled or glass

Silverplating of bus bar contact surfaces while assembling a switchboard for a ship at Todd-Seattle Dry Docks, Inc., Seattle. The trowel type anode and cover are being used here for this type of work on large surfaces such as bus bar

pans or dishes for holding the plating solution.

Caution should be taken, because the silver solution is poisonous, and rubber gloves should be worn while plating to protect hands from the solution.

Other dishes or pans should also be provided, one to place under the object being plated to catch the surplus solution dripping off. Another is used to wash the metal before plating. Another to rinse off the plating solution after plating.

Clean rags are handy for a number of uses.

Cleanliness in all steps of the work is necessary to insure success.

If dishes or pans become soiled they should be cleaned. Under no circumstances should anyone drink from a glass or cup which has been used to pour or measure the solution.

Preparation of the metal—Electrical contacts should be cleaned with fine emery or crocus cloth preparatory to plating. Large surfaces can be buffed with a wire brush or polishing wheel.

All sharp edges of laminated or other blades should be smoothed and rounded slightly to prevent cutting of the anode covers.

Remove all grease from parts to be plated with carbon tetrachloride, gasoline or denatured alcohol.

Scrub the surface to be plated with a cleaning solution and rinse with clean water. If properly cleaned the water will cling to the entire surface without creeping. Creeping indicates presence of grease.

Keep the surface wet and start plating immediately, if possible, to prevent oxydation.

To prevent plating where not desired, mask with Scotch tape or masking tape or paint with acid resisting paint.

To Plate — With metal prepared for plating a methodical procedure will save confusion, save materials, lessen chances of failure and produce more satisfactory results.

First have all materials required laid out, ready.

Before connecting rectifier, select proper anode and cover for the work, and assemble them.

Connect the negative wire to the binding post marked "negative" or (—). Connect the end with the clip to the metal to be plated a short distance from the part to be plated.

Connect the positive wire to the positive or (+) binding post. Fasten the other end to the plating anode.

Place some of the solution in a pan. Shake the bottle before pouring. Place the receiving pan under the part to be plated.

Close the switch on the rectifier.

Soak the cover of the anode in the solution one or two minutes.

Wet the surface to be plated in clean water.

Plate the surface by pressing the anode and cover, well saturated with solution, moving them slowly over the surface back and forth. Keep the anode moving slowly. Give the edges extra plating.

If using the brush type, make sure the bristles are thoroughly saturated with solution and press sufficiently to get the bristles into the crevices of the surfaces being plated.

Wash plated surface thoroughly with water immediately after plating. If interrupted, be sure to wash plating solution before leaving.

Time—Three to five minutes will deposit a substantial coating of silver. Switch contacts should be heavily plated, at least five minutes. Bus bars or fixed contact points need only a half minute.

Care of equipment—Clean equipment will produce good results. After using, all plating equipment should be washed in clean water.

Pads should be squeezed of water and allowed to dry. Anodes should be removed, washed and, if found to have any corrosion, should be polished to keep their contact surfaces bright. Covers that are worn or dirty should be discarded. The plating brush, if used, should be washed thoroughly in cold water, not hot, for hot will injure the bristles. It too should be allowed to dry.

Plating solution that has been used should be placed in a bottle marked "used plating solution." It can be used once or twice or until the metal is completely gone from it. Never place used solution back in with fresh solution, as it may contain dirt to spoil it. If a deposit is thin in plating, discard the solution and use new. Plating a test piece will determine this.

Troubles — If the plating is not successful, check the following. It will probably be from one of these causes.

1. Current supply should be checked, connections, contacts, the wire itself.

2. Check whether the current was too high or too low.

3. Did you use the right anode and cover for the job? Was the cover in good condition? Was it well saturated with solution?

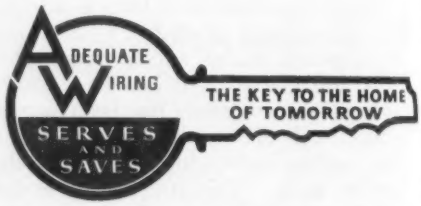
4. Did you keep the anode moving? This is important.

5. Was there oil or grease on the surface? Was the surface clean?

6. Was the surface allowed to dry after cleaning and before plating? It should be kept wet.

Key Theme

That homes of the postwar period may have a "key" to the operation of postwar electrical equipment is an idea which the industry can keep on saying in its advertising and promotion during these times. This is the contention of the National Adequate Wiring Bureau and to make this possible it has reproduced in the form of mats and engravings its symbol illustrated here. This slogan offers a practical base for postwar planning in the residential market, said O. C. Small, secretary of the bureau, by capitalizing on the mounting wave of public interest in the postwar home. The mats and cuts are made available at very low cost and all advertising is urged to make use of them. In this way a strong foundation for educational and promotional programs dealing with postwar home planning can be furthered.



Key slogan used in all promotion

Attractive folder to keep alive the idea that adequate wiring is the key to the home of tomorrow is also made available by the National Adequate Wiring Bureau for distribution by utilities, contractors or associations at a cent per copy in quantities of 20,000 or less. It is of the size suitable for an envelope or bill stuffer and also can be used on home calls.

Code Stop Date

Stop date for proposed changes to the National Electrical Code, which is to be revised and a new edition issued in 1945, has been set by a special committee of the Code making Electrical Committee as Sept. 30, 1944. Article committee reports to chairman of the Electrical Committee are due Dec. 15. These reports will be issued Feb. 15, 1945, and the Electrical Committee itself will meet May 21, 1945. The code then will be issued in the fall of 1945. It is expected that a major topic of business at each of the section meetings of the International Association of Electrical Inspectors in August and September will be the proposed Code changes. The Northwestern Section will meet at Olympia, Wash., Aug. 21 to 23; the Southwestern Section at Modesto Aug. 28 to 30.

New Wire Plant on Coast

Essex installs modern machinery for drawing and insulating wire

Shown here are heavy horizontal paper and fabric machines, the sections for insulating square and rectangular wire

TO effect more prompt deliveries on the West Coast, Essex Wire Corp. has established a precision manufacturing and insulating mill on a 10-acre site at Anaheim, Calif. In setting up a California company to control the new operation, Essex was joined by its Pacific Coast representative, Tri-State Supply Corp.

At this new plant, Essex has installed modern equipment to make bare wire in sizes No. 8 to 42 and to insulate it in the form of magnet wire, either according to standard specifications or on special order to suit individual requirements.

Manufacturing buildings, a power house and a Santa Fe track siding, formerly used by the Anaheim Sugar Co., were secured and have been supplemented by a large synthetic enameling process room, a direct-current generating and electrical distributing system, offices, freight loading and unloading facilities. Power is supplied by the City of Anaheim.

One of the three main raw products, pure electrolytic copper rod, comes from mines and refineries of the West. Cotton yarns are shipped from the south and synthetic and oleo-resinous enamels from the midwest.

In the copper drawing section, a nine-die mill breaks down rod from ⅜- or 5/16-in. diameter to all gauges from solid No. 8 to No. 42 B&S gauge. It is drawn cold, then annealed.

In addition, a twin set-up of medium wire rolling machines can roll up to ½-in. strips of rectangular or square wire, used in power transformers and large specially designed generators and charging mechanisms.

The installation includes the latest type "bell" annealing furnace, which produces a "dead soft" copper wire without danger of oxydation. To do this, an atmosphere of natural gas manufactured during the annealing process from "combusted" natural gas is introduced into the furnace unit. Uniformity of the annealed wire is controlled by accurate, late type recording devices and thermocouples placed in the "bells" of the furnace. Automatic electric cranes handle heating and cooling units and move the copper to the various control stations.

Equipment for manufacturing and distributing the various cleaning solutions is powered by boilers. Flow is controlled by automatic pumps and motors of various sizes.

Over-all covering of fabric, paper or fiberglass is spirally wound on a series of horizontal machines, which pass the wire through delicate "nose pieces," or applicators, and over large sheaves to prevent hardening.

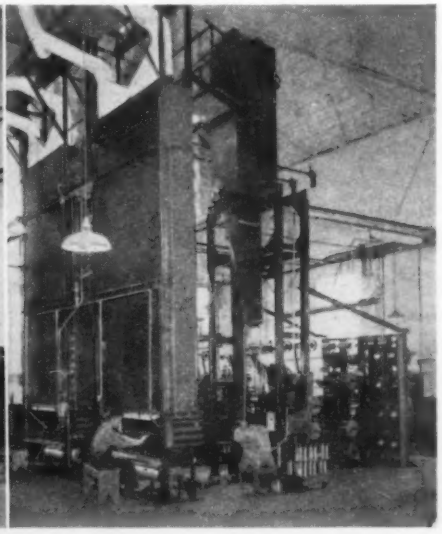
External varnish, or binder, is baked thoroughly in an electric furnace, where temperature can be controlled to meet specifications. In the enameling room, wire passes from the enamel baths into electric ovens in which recording devices and thermocouples control the heat.

In addition to the conventional oleo-resinous enamels, the more popular sizes of "formvar" wire can be turned out in the Anaheim plant. For the latter, a polyvinyl acetate type of resin is polymerized at high controlled temperatures. To insure "softness," an electrically controlled annealer, with quenching tanks and wipers, has been placed ahead of the applicator on each "formvar" machine.

Cotton is applied to the wire on a large bank of vertical applicators. Essex also can place insulating paper of standard widths from .001 to .002-in. thickness, or a combination of paper and cotton.

Modern testing and inspection equipment, supplementary rewinding facilities for special orders and an aging oven are other features of the installation.

C. F. Bowers, president of Tri-State Supply, also heads the new Essex California Corp. Robert W. Mungall is chief engineer and plant manager.



Breakdown mill at left; center, electric annealing furnace is lifted from charge; right, bank of heavy applicators and furnaces for applying "formvar" coat

Conservice-II Begins Tour of West

Display boards that really operate, new films and pictorial repair guides glamorize training schools

LAUNCHING a new "conservice" program of appliance repair training, Westinghouse Electric & Mfg. Co. appliance division opened in Seattle, April 11-12 a series of two-day schools which will eventually cover the entire West. Equipped with new and spectacular demonstration boards and cutaway models of refrigerator, range, washing machine, ironer, and small appliances, together with new sound-slide films, the school is being taken throughout the West by James A. Brown, recently appointed Pacific Coast District service manager, succeeding E. C. Watts, who was transferred to the East Springfield plant, and by Walter Schanz, Northwest service manager, Seattle.

The refrigeration demonstration board is particularly ingenious. Equipped with a compressor, a transparent plastic evaporator connected to a float valve and a fan cooled condenser, it also has an impedance tube and plate type condenser which may be demonstrated as well. Really a working model, these devices actually produce refrigeration. Controls are so wired that various causes of failure or trouble can be set up and the service man check to isolate the unit giving trouble in order to fix it.

Similarly the washing machine, stripped of tub and extraneous parts, is cut away to show the actual working parts of drive and wringer. The ironer, too, is opened up to show its working parts and irons and small appliances are carried along in the school to show repair methods. While all the equipment shown is Westinghouse, the principles involved apply to other makes and dealers and service men and women of all dealers are invited to and do attend the conservice school.

As set up the two-day school is arranged in four sessions, either morning and afternoon or afternoon and evening. The first three-hour session is devoted to electric ranges; the second to refrigeration, the third to laundry equipment and the final to small appliances.

Each subject is carried through. When, for instance, controls on refrigeration are being taught, the sound-slide film pertaining to controls is shown, followed up with charts and discussion and finally demonstration at the board itself. At the end of each of this type of coverage, quiz forms are given each member of the class. The quiz papers, however, are not collected, each one checking his own correctness against the correct answers then presented by the instructor. Only the person knows whether he has been correct or not, thus not embarrassing him before the class.

On the small appliances, the class actually disassembles and reassembles each appliance, being instructed as they do so as to the most practical repair methods. To round out the entire responsibility of the service repair man a 30-minute sound slide film, *The Service Man—a Four-in-One Guy*, depicts the service man as a good mechanic, a business man in keeping records and meeting the public, a doctor in diagnosing sick appliances, and an actor in being a sympathetic listener to all complaints.

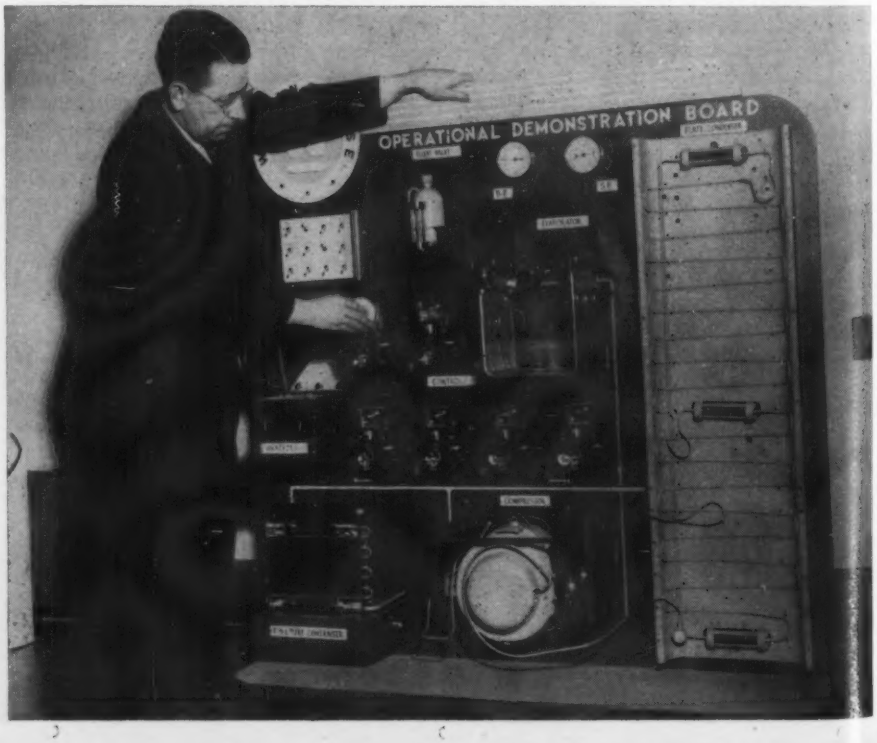
New *Conservice Guides* are also supplied those who attend. These give step-by-step, illustrated information on repairs of each appliance.

Schedule of schools already held and those to be held in the coast region is as follows: Seattle, April 11-12; Tacoma, April 19-20; (Portland and Medford are to be scheduled later) Reno, April 22-23; Los Angeles May 3-4; San Bernardino, May 10-11; Phoenix, May 16-17; San Diego, May 24-25; Fresno, June 1-2; San Jose, June 6-7; Oakland, June 13-14; Stockton, June 20-21; Sacramento, June 27-28; Chico, July 6-7; Eureka, July 11-12; Santa Rosa, July 18-19; San Francisco July 25-26. The Northwest will also get a series of schools to cover all the major cities of the area but the dates have not yet been arranged.

At the Reno meetings, held by Saviers Electric Products Corp., the attendance was 77 dealers and service men from all of western Nevada. In Los Angeles the school will be at the Southern California Edison Co. auditorium. Schools are sponsored by Westinghouse Electric Supply Co. with Everett Isenhower, appliance manager, Los Angeles; J. N. Barker, appliance manager, San Francisco; L. D. Pulsifer, appliance manager, Seattle, in charge of their respective areas.

● ANOTHER Home Planners Institute, similar to that described in last month's *Electrical West* in Pomona, has been started in San Jose, Calif., in cooperation with the building and loan groups. Jack Ross, division sales manager, Pacific Gas and Electric Co., is active in the organization and programming of the electrical part of the instruction program.

All working parts of both old and new model refrigerators are opened out on this working demonstration board which James A. Brown, Pacific Coast district service manager of Westinghouse's appliance division, brings with him on his Conservice training school tour. Troubles likely to occur to a refrigerator are simulated on this board and repairmen can locate the faults and make the repair



Names Carries On

Repair business requires foresight and investment

Herb Names, Inc., "Modern Living," of Denver, is inheriting a great deal of appliance repair business of that city because, like everything he does, he is making a specialty of it.

A successful appliance repair business, says Names, cannot be a haphazard affair. That is why a great many make a failure of it. It isn't a business to make much money, he feels, but he does believe it will be a means of staying in the electrical business through the duration and thus preparing the way for postwar re-entry into intensive appliance and radio merchandising.

The two problems of successful appliance repair business must be faced courageously and thinking done upon them in advance. These are the provision of a large stock of repair parts, which takes a considerable investment and a good deal of foresight and long-range planning. The other problem is that of personnel.

By anticipating the need for repair parts sufficiently in advance and ordering in order to keep the stock up, Names has been able to maintain a very satisfactory stock of parts and thus give a faster service to his customers.

As to personnel he also anticipated that all men of draft age would eventually be called and so from the beginning staffed his repair organization entirely with men over 45 or definitely of 4F classification. He has also taken several discharged veterans of mechanical ability, given them special training, and finds them a valuable asset to his personnel.

The store, which always had an ample display of refrigerators and radios, looks somewhat bare, but there is a stock of used radios and some ice refrigerators and a few other used appliances. In order not to sell himself out of business Names has made it a strict policy that none of the used and rebuilt radios which he offers for sale can be sold unless another radio is turned in on the sale. This, then is likewise rebuilt and made salable.

For phonograph combination sets he requires a turn-in of another combination or a radio of 1935 or later. He used to sell about four a week: sells about one a week now but still has stock on hand.

Names is not interested in lines of other than electrical goods at the present time nor is he interested in victory models unless they can carry the proper profit margin. He does not ask more margin than previously but feels that to maintain his business, it is necessary that at least the equivalent profit of the former merchandise be provided.

It takes all the Names' diplomacy Monday mornings to placate all the housewives whose washing machines have suddenly broken down and who immediately want a service man to come out so they can continue their washing. "Sometimes all four phones are hot," said Names, "and it takes all the explaining in the world to show them that, with our limited number of men, we can't possibly be in all places at once on Monday mornings." As the other appliance dealers in town give up their service departments one by one, it throws more of a burden on his organization, but he hopes to make it go for the duration.

Utah Training Program

Training classes for refrigeration repairmen have been organized in five Utah cities through cooperation of the National Refrigeration Service Manpower Committee and the Electrical League of Utah. With a total enrollment of 133 men, classes are being conducted in Salt Lake City, Ogden, Logan, Provo and Price.

This program is an outgrowth of the work of the National Refrigeration War Council, organized shortly after Pearl Harbor to aid in food conservation. First action of this group was an attempt to keep skilled mechanics in the industry and to have the occupation placed on WMC's critical list. To replace manpower withdrawn, a task committee was formed and the present training program inaugurated.

Students for the Utah classes are more or less hand picked, having been recruited mainly from jobbers, distributors, dealers and repair agencies closely associated with the refrigeration industry. According to J. F. McAllister, field coordinator for the National Refrigeration Service Manpower Committee, it was impossible to handle all the applicants and, while it is too early to forecast the future of the program, it is hoped that additional classes will be made available.

To expedite the training, a standard course was developed and is designed to give new workers the fundamental knowledge and skill required to service all refrigeration equipment.

Covering 201 hours of classroom and laboratory work, the course is divided into three parts: (1) general, (2) domestic, (3) commercial. Included are fundamentals of refrigeration, refrigerants, compression system, compressors, refrigerant controls, motors, motor controls, servicing domestic units, absorption systems, commercial systems, commercial evaporators, commercial condensing units, commercial electrical systems, servicing commercial systems.

The course is given without charge through funds made available to local vocational training schools to cover the cost of salaries, text materials and rentals. The five classes now underway are held from 7 to 10 p.m. three times a week, on Monday, Wednesday and Friday.

Trading Post Results

A total of 703 electrical appliances has been sold for $3,606 to date, according to C. J. Galloway, manager of the Reddy Kilowatt Trading Posts of the Washington Water Power Co.

Appliance exchanges were started throughout the territory of the electric company in December of 1943 to assist newcomers, war workers, etc., in purchasing appliances no longer manufactured, and to enable customers who owned duplicate appliances to sell them at no cost to themselves. Those having appliances in good working condition bring them into the company's offices, the customer sets the price, and they are then displayed and sold by the company. A full description of the method of operation of the Trading Post appeared in Feb. 1944, p. 89.

● DRAFT of young fathers previously deferred, up to age 37, has made acute again the manpower shortage in service and repair shops for appliances everywhere. The Bureau of Radio and Electrical Appliances of San Diego County sent out a bulletin to members, informing them of this condition and setting forth in detail what steps should be taken with the Selective Service in order to protect essential personnel. Refrigeration service men, it was hoped, might be retained, although other types of service personnel would not be so easy.

● A NATIONAL ELECTRICAL RETAILERS' ASSN. is being organized and incorporated in Illinois. The organization, it is announced, intends to include all retailers of electrical appliances. Its purposes will be to promote, attain and establish high ideals in merchandising of electrical products such as appliances, radio, lighting and other equipment. It also intends to disseminate information and to promote better cooperative activity among retailers, contributing to high national income and employment. Its officers have not yet been announced.

Breakdown Prevention Better than Cure

Customer contact and advice program in WWP territory attempts to prolong appliance life

A SYSTEM-WIDE program to assist national efforts in conservation was launched in January by the Washington Water Power Co. In addition to its primary objective to encourage the economical use of electricity, the program seeks to place unused and surplus appliances in the hands of needy war workers in the critical Spokane area and to help customers prolong the life of appliances now in use.

It has been estimated by company research that at least 150,000 electrical appliances in that area have broken down in the past two years and been put out of service, many of them due to improper care. Small motors have not been oiled regularly; the refrigerator has been abused with resultant food spoilage; objects have slipped down the washing machine drain and damaged the pump; table appliances have been permitted to burn needlessly, thus shortening life; electrical cords have been mistreated.

With spare parts more and more difficult to obtain, it seemed to management extremely important that customers be given simple instructions which would prolong the life of all useful appliances. This care-and-use instruction, coupled with an appliance inventory of the home, and a special urge not to waste electricity just because it is not rationed, made an important program in the eyes of both company and customer.

In designing the program, the company was careful not to conflict with manpower shortages in the area, and use of tires and gasoline is avoided.

The customer is reached in several ways. First an attempt is made to inform employees of the general situation, each man and woman working for the company being appointed committee member number one to carry the message to neighbors and friends. Advertising is also used, with newspaper, radio spots, window displays, and bill stuffers supporting the program. Also, a limited number of field representatives is permitted to contact the customer in his home, providing more urgent matters do not interfere.

These field representatives, extremely limited because of manpower shortage and the draft, may be augmented gradually by ex-service men who have been discharged because of illness or injury. In giving employment to discharged service men, the company believes that it is encouraging and providing a feeling of security to men who need encouragement most.

On each house call, the field representative leaves with the customer an appliance check-chart which is made attractive with monthly calendars and statements regarding conservation by Office of War Utilities Director J. A. Krug, and Vice-Chairman of Civilian Requirements Arthur D. Whiteside. Through these statements the customer learns why conservation efforts have the full approval of governmental agencies, and why waste should be avoided and all appliances preserved.

Home Front Book

Supplementing its consumer service, described in *Electrical West*, Oct. 1943, page 74, the Bureau of Power and Light of Los Angeles has just issued a consumer appliance conservation booklet, *The Home Front*. Like any other publication of this type, its purpose is to indicate to consumers the important items of proper care of appliances to avoid the need for repairs and to prolong their life.

The booklet is available from the branch offices of the bureau and is supplied to dealer stores. It is also being distributed by the residential service organization in its contacts with consumers.

The book ties in the Matchless electric home, tells something of the wiring story and individually it advises regarding each appliance. Space is provided for the listing of information regarding the appliance and its model number by the consumer, thus keeping it as an inventory of appliances owned. Cord repairs and fuse replacement instructions are likewise included.

● OPINIONS AND SUGGESTIONS from dealers, distributors and manufacturers in the Portland area as to their attitude and their anticipation of market conditions in the appliance business after the war have been sought out by James B. Buman, manager of residential and rural sales of Northwestern Electric Co., Portland. These are published in the March issue of the company's dealer paper, *Northwestern Dealer News*. Arnold Kuhnhausen argues that something be done about the "I can get it for you wholesale" evil, even if it requires legislation. Oliver Petrie asks that terms be shortened. S. A. Waldron anticipates a whirlwind of advertising and promotion from all industries fighting for customer dollars. Sam Soble declares that, if discounts are shortened, promotion will be lessened. Charles Matthews advises readiness to sell in all ways. Harold Kelley also urges shorter terms. John O'Neill foresees strong competition and possibly shorter margins. George Boring anticipates big demands for new devices. A. L. Shellworth warns that the sellers' market will not last. Paul Fowler anticipates water heater demand. J. K. Byron stresses the need to tell the public there must be a transition period. N. A. Hayes expects higher prices to prevail for some time.

● NANCY FINCH, well known throughout Utah and eastern Idaho as home service director for Utah Power & Light Co., has left that company to set up a business of her own in Salt Lake City. Called *Business Aid*, Miss Finch plans to do home service and home economics work for a number of clients and also to offer stenographic, accounting and bookkeeping and other business assistance either to local businesses or to visiting manufacturers' representatives or salesmen in need of stenographic service, telephone appointments and other business assistance. She will continue to serve Utah Power & Light Co. as a client and conduct that company's fall radio program. Her office is in the First National Bank Bldg., Salt Lake City.

● ELECTROMASTER'S home economics department is offering a series of four monthly bulletins on the preservation of food by freezing. This Detroit manufacturer of electric ranges offers the series to dealers and utilities. The initial bulletin is entitled *Preservation of Food by Freezing and Chemical and Physical Changes Which May Occur*. Others will deal with preparation of fruits and vegetables and there will be one on meat, poultry, fish and game. Cooking of frozen foods will be discussed in the last number of the series.

● DEALERS AND DISTRIBUTORS throughout the territory of Utah Power & Light Co. will be called together in a series of meetings soon, according to plans being made by W. A. Huckins, sales manager, to discuss dealer ideas and prospects for business under wartime conditions. The company's dealer help policy and aids will be explained as well as the outlook for appliances, service and repair problems, sales training for the future.

● FLUORESCENT fixtures for the home are being announced in advertisements at Lipman Wolfe's in Portland.

● FALL MARKET WEEK at the Western Merchandise Mart, San Francisco, has been set for July 24 to 29 by Frank K. Runyan, president of the Mart. The Los Angeles "At Home" showings will be held there July 17 to 22 and the Chicago Market July 6 to 15. "While undoubtedly the supply of such goods as electrical appliances will be absent, there will be many lines of merchandise such as housewares and giftwares made of non-critical materials that will be available in fair quantities," said Runyan.

Farm Contest

For the best letters from rural customers telling how electricity is being used to produce food for victory, Utah Power & Light and Western Colorado Power companies are offering War Bond prizes in a contest which will run until Aug. 1.

Heralded by newspaper ads and broadsides, this "Food for Victory" contest is open to any customer of the two companies engaged in farming or gardening or otherwise producing food in the designated areas. Literary merit is not a determining factor in the judging, it was announced, nor is length of letter. Entries will be judged solely on basis of the best adaptation of electricity to food production, "best" being defined as that which most effectively saves labor and time and increases efficiency.

For purposes of the contest, Utah Power & Light territory is divided into 20 districts and Western Colorado power territory into four districts, with a $50 War Bond to be awarded each district winner. Additional grand prizes will consist of $100, $50 and $25 War Bonds for Utah and for Idaho and Wyoming combined and $50 and $25 Bonds for Western Colorado contestants.

Judges will be men prominent in agriculture.

● REPRINTING A SERIES of advertisements on farm electrification which appeared in the *Farm Bureau Monthly*, the *Southern California Rancher* and *San Diego Poultry Journal* as well as several of its county newspapers, the San Diego Gas & Electric Co. combines in one booklet its messages to the farm customers it serves. These have been distributed to such customers as a follow-up of its advertising. Since most of the advertisements are testimonials of how well-known customers in various parts of its territory employ electricity on their farms and the results they get from it, the series has a two-fold value of promoting goodwill and stimulating further uses of electricity on the farm.

Materials Improve, Manpower Worse

Iron promise cut, metals allowed switchgear and fixtures, sales tax rulings on lamps, in April

ALTHOUGH supply of materials eased the critical situation which had inhibited reasonable ruggedness of many electrical devices, the deep draft on manpower and the critical shortage of labor this made in many manufacturing centers offset the gain promised. The electric iron schedule for 1944, first set at two million irons, was divided by ten and relegated to manufacturers in areas of ample manpower. Only 200,000 irons are to be made. Makers permitted include American Pressboard Co.; Dejur Electric Works; A. W. Waage Electric, Bersted, Brannon Electric Appliance; Crown Manufacturing; Steem Electric; Stern Brown Inc., and Superior Products, Inc. None of the nationally known companies are on the list.

● SAFETY SWITCHES, panelboards and service entrance equipment are again permitted to use heavier gauge of steel. Even doors can be made for panelboards again. Restrictions on steel for semi-dust tight enclosures for floor mounted control equipment were also lifted to eliminate ordering of explosion and dust-proof enclosures when not absolutely necessary. Specifications on bus bars, connecting straps and terminals were lifted also.

● FLUORESCENT FIXTURES were again permitted to have sheet steel reflectors instead of hardboard, and metal for closing in the ends of reflectors and shields, for louvers and baffles. However the amendment to L-78 prohibits many types of fixtures, notably of the single tube type.

● COPPER will be allowed for wafer thermostats for poultry incubators and brooders, the iron ones having deteriorated by corrosion. Other copper uses are permitted again in amended M-9-c, April 4.

● FRACTIONAL HORSEPOWER MOTOR production rose to new highs in February. Despite this, little hope is held that any will be available for civilian uses, as aircraft orders still exceed supply.

● REFRIGERATOR REPAIR PARTS production is above levels of a year ago. However, manpower shortages to assemble parts slow the output. Some motors and some freon gas will be available for repairs and replacement. WPB says that many repair shops are not taking full advantage of CMP-9-A to obtain needed materials and metals for repairs. This material is for maintenance and repair and for rebuilding of equipment to make it fit for use, but not to add to or improve it.

● TRANSFORMERS, however, are tighter. Heavy demands for radio and radar transformers and manpower shortage have forced OWU to amend supplementary orders U-1-c, d, f, and h to curtail use of distribution transformers of 5 kva. and under. Purchase orders can only be placed with approval of regional utility engineers who will be assigned monthly quotas. Other changes in these orders affect extensions for cooking, extensions to commercial and industrial consumers, wholesale and retail establishments, physicians offices, restaurants, and revise utilities construction standards.

● RIGID CONDUIT industry advisory committee recently severely censured the application of L-225 by engineers, under which conduit was not used in many industrial and other locations where safety required it, the committee claimed, and fires and accidents resulted. Named specifically was the wiring of a series of warehouses constructed by Kaiser Shipbuilding Corp. where, instead of conduit, a fiber raceway was used on exposed work. Mechanical injury opened these raceways, the committee claimed, and exposed conductors. The system had to be rewired in conduit. The committee asked removal of restrictions on conduit on this and several other grounds.

● ARMORED CABLE prices were set in a new dollar-and-cents schedule by OPA, effective April 3. New prices were increased for eight producers but not higher than the other five. Manufacture was resumed in September 1943 after a one-year cessation.

● SALES TAX is taken on top of the total of repair price plus the new federal excise tax. This ruling has been made both in California and in Utah and probably will be in other states where sales tax is collected. Thus, on $10 worth of lamps, the excise tax of 20% on manufacturers' selling price will be 75 cents. Sales tax is then taken on $10.75, the retail selling price.

ELECTRICAL WEST

McGRAW-HILL COMPANY OF CALIFORNIA
68 POST ST. SAN FRANCISCO . 4

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Postwar Competition

CHAIRMAN LELAND OLDS of the Federal Power Commission recently outlined a postwar program for electric light and power utilities. In his thesis he set up six objectives which he considered vital in meeting the challenge of the period following the war: (1) Acceptance of the obligations enforced by real competition rather than monopoly. (2) Extension of cost controls to achieve such a competitive position. (3) Conformance to a straight-line depreciation reserve policy. (4) Retention of wartime pool operation economies in the postwar period. (5) Fostering industrial decentralization and the development of a balanced rural-urban economy. (6) Cooperation in the "new unitary approach to conservation and utilization of the country's natural resources," i.e., the program of regional river basin developments involving hydro power.

"Private utility companies in playing their proper part in this program," said Chairman Olds, "must introduce all of the incentives to enterprise in building markets and reducing costs which free competition provides in the competitive industries. Utility management may obtain the benefits of free enterprise by voluntary and aggressive competition among companies to reduce costs and rates. Regulatory commissions, in turn, should foster the spirit of competition by devising standards and procedures which will recognize and reward results achieved."

Few will argue with Mr. Olds over the validity of his major premises. However, it is reasonable to point out to him that he misses a primary economic and industrial tenet—that the driving force in competitive markets is the profit motive. In practice, the system of utility regulation which he represents, aims at limiting profits, with little regard to the ability or ingenuity of management to effect economies and reduce costs to the consumers.

There is far more to the competitive relationship of organizations in a free enterprise economy than imposition of cost controls and acceptance of the obligations of competition. It is almost axiomatic that in the most competitive industries, the organizations with reputations for the lowest prices and the best service are the ones earning the greatest returns for their stockholders. To achieve some of the things which Mr. Olds suggests, it is going to be necessary for the American people to reassert their belief in the traditions of private enterprise and to implement that assertion so that initiative can function.

The power companies have demonstrated their ability to perform in the face of difficulties in the contribution they have made to the war effort. Whether they can accept Mr. Olds' postwar challenge will not depend upon their initiative so much as upon their release from threatening restrictions. Encroachment of non-tax-paying publicly owned utilities is one such threat. Increased costs and increased taxes are others. So is too much regulation.

The West's Industrial Evolution

THE ELECTRIC INDUSTRY, more than any other perhaps, has a great stake in the Far Western industrial revolution stemming from the war. It was the availability of adequate supplies of low-cost electric power which attracted many of the industries originally. Continued utilization of that power is going to depend to some degree on the postwar stability of the industries in question, or upon their ability to convert from war goods to consumer products.

However, that is only half the answer to the problem. Most of the plant facilities are owned by the federal government. The Defense Plant Corporation has invested upwards of $15,000,000,000 in new industrial plants and more than 10% of these new factories are in the Far West. The ultimate disposition of these government owned war plants will have a marked effect upon the in-

dustrial evolution of this region. Our industry can take a sane course of leadership in guiding Western thinking on this subject. Already there are indications that special interests may seek anything from closing down these plants to suggesting that their continued operation be insured by subsides. To prevail and to succeed, our Western industrial revolution must rest upon a solid foundation of economics. Some of the present theories are far from that.

Code in Vacuum

BETWEEN the theoretical ideal expressed in the words, "Let the Code Decide" and its attainment lies the same wide valley of practical realities that make the Code difficult to adopt as a uniform ordinance. Observing from the sidelines the play of viewpoints and interests, the realist with any sort of perspective concludes that theory is theory and practice is something else again and ne'er the twain shall meet. Everyone may just as well settle for some fairly agreeable compromise.

The Code to be a code, must be a precise instrument, it must be comprehensive, it must permit any and every reasonably safe method and material, selecting none, exploring all the possible ramifications of use and determining nothing but the safe application of them. It is as if it were created and kept in a vacuum.

Practical wiring, on the other extreme, cannot live in a vacuum. It is a realistic, common sense, practical craft. The men who engage in it are "narrow backs" or wiremen, (with a large sprinkling of "grunts" or helpers or apprentices). They have a job to put in and no time to argue the fine shades of meaning contained in complicated code wording, printed in fine print and hidden somewhere in a 360-page book with paragraphs in one part of it perhaps in conflict with others somewhere else.

Is it any wonder that when a local ordinance is under consideration, there is a strong desire on the part of the local wiremen and contractors, and the inspectors who spring from their craft, to want to narrow it down to one or two wiring methods, one line of material and fittings, one skill to develop for its installation?

Often heard from manufacturers of competing materials or methods and from utility representatives who may have a favorite development of their own to promote, is the accusation that opposition to universal adoption of the National Electrical Code in all of its complexity comes from labor which wishes to make more work. How much of it reasonably comes from the abhorrence of the mental work involved in comprehending a complicated, all-inclusive Code?

Nothing can be done about it, because always there will be this conflict between the unlimited creativeness of inventive minds bringing forth new materials and new methods, and the conservative dislike of bothering with more than the mind can encompass from the men who string the wire. There is to be a new edition of the Code next year. The battle over theories will wage hot this fall and next spring as changes are discussed and accepted or discarded. When it is all over, as it has always been, the practical and commonsense will survive and be done in wiring; the impractical will die of neglect.

"Let the Code Decide," is none the less a fine ideal to work toward, even though it is Nature that really decides, (Art. 1102 — Nature, Class 1, Human).

WE are thinking about postwar problems but we realize that our most important contribution to postwar is to hasten the day of victory; for nothing can contribute more to our country's prosperity and well-being than the earliest possible victorious ending of the war—both in Europe and in the Pacific . . . We look forward to a record postwar construction program and we have many new things which we expect to do. We expect to provide intercity networks—ultimately nationwide in extent—for television. We plan to try out shortwave radio relay systems for long distance telephone service and for television. We know that coaxial cable systems—cables which are capable of carrying several hundred telephone conversations simultaneously in two metal tubes a little larger than a lead pencil with a copper wire inside each extending along its axis—work very satisfactorily but we do not know whether or not radio relay systems will work better or prove more economical. We are in the communication business and we intend to use the best and most economical means whether wire or radio . . . We expect to extend automatic long distance switching systems and the subscriber dialing of toll calls. We expect to extend overseas radio telephone service and to reduce its cost.—Walter S. Gifford, president, American Telephone and Telegraph Company.

Inspectors Prepare for a New Code

Rocky Mountain, Utah and Montana Chapters IAEI group their annual meetings to hear authorities discuss wiring, the Code, sales control

A NEW National Electrical Code in 1945, the need for uniform ordinances with control to prevent dumping of unsafe appliances at war's end, overcurrent protection and elimination of No. 14 wire, and the common neutral arose as major concerns from three crowded programs of three annual chapter meetings of the International Association of Electrical Inspectors in Denver, Salt Lake City and Great Falls during the week of April 10. Like a traveling chautauqua, the headlined speakers trouped from one to the other, presenting talks, moving pictures or conducting Code discussions.

Of interest to the industry is a summation, an analysis of the significant views brought out in the series, more than a detailed report of each meeting in minute detail.

Each meeting was surprisingly well attended. The Rocky Mountain Chapter, April 10-11, under chairmanship of Charles B. Farrah, chief inspector, Denver, despite a blizzard, had 50 registered. The Utah Chapter, April 12, under Chairman Reuben Baxter, electrical inspector, Salt Lake City, registered 160 and the Montana Chapter, April 14-15, under Chairman John R. Crawford, city inspector, Butte, had a registration of 130. Although this registration included utility, wholesaler, contractor and manufacturer representatives, the number of active inspectors was high in each instance.

New Code in 1945

It was Victor H. Tousley, secretary-treasurer of IAEI, Chicago, who brought word of a new Code in 1945. The emergency committee, augmented by members of the Code forming electrical committee, at a recent meeting decided that a new Code was needed. The 1940 edition, punctured by some 90 interim amendments designed to curtail use of critical copper, rubber and steel, would be in no shape for use should war end and construction begin. Arrangements are being made for electrical committee meetings this winter. Inspectors will vote their opinions at the fall section meetings on proposed Code changes already preprinted and distributed.

A questionnaire is to be sent all members of IAEI to canvass experience with emergency and substitute materials so far in order to guide the Code makers in deciding which to accept as permanent, which to rule out.

Charles Farrah of Denver turns over the Rocky Mountain Chapter gavel to V. D. Markham, Colorado Springs inspector, who was elected new chairman

Tousley announced new interim changes agreed upon at the last meeting, among them permission to use dry type transformers of 100 kva. or over inside premises if protected by fire-resistant walls or barriers (Interim No. 85) unless insulated with Class B or fireproof insulation; a more liberal allowance on the size of conductors for ranges, especially in groups; permission to use copper-clad steel No. 16 solid wire, SN, for control conductors in machine tools. He also announced the publication of the full report of the study of grounding to water pipes instituted by waterworks and plumbing groups. Data therein, he felt, should end the arguments regarding grounding to water systems.

At two meetings, Tousley also outlined the scope of study delegated to eight postwar planning committees of IAEI and likewise told of revisions to the War Production Board critical list which permits more outlets in FHA war housing construction.

Austin Dunham of Anaconda, Denver, is interested but Victor Tousley, IAEI secretary, dubious as A. J. "Scottie" Alcock, Underwriters', Chicago, argues some question on the National Code

Unsafe Appliance Ordinances

Forecasting unlimited flooding of appliance-starved markets after the war with many unsafe materials, devices and appliances, inspectors were urged by several speakers to prepare for resumption of selling by passing ordinances requiring tested and approved safe equipment as a condition of sale. W. A. Cyr, associate editor, ELECTRICAL WEST, chairman of the IAEI sales control committee, and Fred Weber, Oregon Insurance Rating Bureau, secretary of the Northwest Section, and chairman of a model ordinance committee of IAEI, both spoke on the subject.

In addressing all three meetings, Cyr first outlined the special need for sales control as an outcome of war substitute conditions, expanded plant facilities of manufacturers, many of which plan appliance production, and possible foreign materials entering American markets. Then he discussed briefly the experience of cities and states in which sales control had proved beneficial to public, dealers and manufacturers alike. He urged immediate action to start the long process necessary to having ordinances or state laws passed. Concluding, he described the methods by which dealers, councilmen, judges, manufacturers and the public must be informed in order to make such laws successful.

His committee, he promised, intends to make out an outline of steps to take and of administration procedure as a guide to inspectors.

Fred Weber included in his discussion of the first draft of a proposed IAEI model electrical ordinance a criticism that it failed to provide for sales control. He spoke before the Utah and Montana groups. Other criticisms to the model ordinance, made by Francis H. Murphy, of Portland, and reported and discussed by Weber, were that it provided no guidance as to fees to support inspection, no provision for trial installations under approval of an appeal board in order to relieve the inspector of full responsibility. Nor did it require the owner to make cor-

rections nor clothe the inspector with power to disconnect service where he found hazardous installation.

Two other criticisms also were made. One was that the board of review was set up to have on it an architect rather than a representative of labor. The other was that it made no provision for licensing of either supervisors or mechanics.

No. 14 Wire—and Fuses

J. Hyde Stayner, Utah Power & Light Co., Salt Lake City, who is president of the Northwest Section, IAEI, speaking at Utah and Montana meetings, recommended adoption of the resolution suggested by the Pacific Coast Electrical Assn. This advocates setting a 20-amp. rating on residential branch circuit and eliminating No. 14 wire. The resolution passed without discussion in Utah. In Montana, at the closing Code discussion forum, the question of the purpose of fuse protection entered the problem. Tousley reminded the group that fuses of 20 amp. would offer no protection to small appliances or devices using small amounts of current. Despite some questioning, the resolution was passed but with a qualification that it be given further study before the Northwest Section meeting in August.

Stayner, who heads the IAEI postwar committee studying the problem of increased load on inadequate installations, brought up the No. 14 wire situation in connection with that. As president of the Northwest Section, he spoke of the safety aims of IAEI. He stressed the value of the *News Bulletin* and the annual proceedings issued by the association and declared that the educational benefits of Code study were something everyone in the industry should take advantage of.

Reading a letter from Chief Sanislo, of the Seattle fire department, respecting celebration of an "Electrical Safety Week," Stayner said he hoped such could be proclaimed in every state in the West next year.

Fuses came in for more discussion at all meetings when James S. Mahan, representing the Fustat manufacturers, talked on the development and present status of the type S or tamper-resisting fuse. At Great Falls he was assisted by A. O. Alderman, of Bussmann Mfg. Co., who demonstrated equipment and short circuit performance of various fuses.

Common Neutral

Armed with a list of 18 questions pertaining to proposed revisions to Article 210, Branch Circuits, and 220, Feeders, Lester B. Johnson, General Electric Co., Salt Lake City, sought the opinions of the three groups on certain controversial points. Accompanying him was H. G. Knoderer, of G-E Co., Bridgeport, who is a member of these article committees. He sat in to clarify some of the points and to listen to the opinions as a guide to his committees.

Johnson only had time on the crowded programs for three of the 18 questions. First of these was whether a common neutral for two or more multi-wire branch circuits should be permitted for interior wiring in residences, in commercial and industrial and out-of-doors. Opinions varied in each locality.

Second question was in respect to lifting the 150 volts to ground limit on lighting circuits under certain conditions. This question quickly swung into discussion of voltages where fluorescent and cold cathode installations are involved. Additional study was urged on this question quite generally. The last question was whether single-pole switch loops can be made of smaller conductors than the other circuit conductors on circuits of higher than 15-amp. rating, and if so whether the 25-ft. limitation is desirable. The question relates chiefly to control of lighting in large bays of industrial plants. Here, too, opinion was divided.

Underwriters Talks

Two representatives of Underwriters' Laboratories, Inc. divided the meetings between them. At Denver A. J. Alcock, service engineer, Chicago, digressed from his assigned topic of emergency wiring materials, which had already been covered. Instead he described the precautions necessary to protect plants and warehouses in which high explosives are handled or stored from lightning. This is complicated where buildings are dispersed over large acreages. Every bit of metal must be bonded to an elaborate multiple grounding system. Since copper is restricted, other means must be taken to connect all metals and to drain off all differences of potential before they can generate a spark.

J. Hyde Stayner, president of the Northwestern Section, is meter foreman, Utah Power & Light Co., Salt Lake City and long an active member in the section and in Utah chapter

Herbert G. Ufer, Western superintendent, Underwriters' Laboratories, Los Angeles, addressing Utah and Montana chapters, told the 50-year history of the organization in much the same detail as contained in the March issue of ELECTRICAL WEST (p. 66). However, at the conclusion he discussed the tests now being made by Underwriters for several manufacturers on Buna-S compounds to seek a suitable substitute for the rubber of rubber-covered wires. Three out of nine compounds so far tested show promise. It was also brought out that a new SNW synthetic moisture-resistant wire has been approved for use where the no longer made type RW previously could be used.

Fred Benz, U. S. Rubber Co., San Francisco, presented a remarkable new moving picture, *Materials of War*, showing, as he announced, "where your tires and rubber-covered wire have gone to." The picture dramatically illustrated the magnitude of the

Traveling troupe which made two or all three meetings—H. G. Ufer, Underwriters', Los Angeles; J. H. Stayner, president Northwestern Section, Salt Lake City; James S. Mahan, representing Fustat manufacturers, Chicago; Fred Weber, secretary Northwestern Section, Portland; Victor Tousley, secretary IAEI, Chicago, W. A. Cyr, Electrical West, San Francisco—taken at Salt Lake

war demands for rubber and the extreme variety of uses to which it is put.

Another picture feature at two meetings was the presentation of two Westinghouse slide films with sound giving simple maintenance requisites for motors and controllers. W. L. Trudgian, Westinghouse Electric & Mfg. Co., Salt Lake City, presented these.

Denver Specialties

Special to the Rocky Mountain Chapter in Denver were several topics not in the other meetings. Chairman Farrah summarized the chapter activities of the year, of which the Code school held in Denver once a month was the outstanding accomplishment. A session of this school was held Monday evening, discussing Article 230. Carl Simon, electrical inspector, Lowry Field, was the discussion leader. The rescue squad from Denver's fire department gave a first aid demonstration also.

Electrical Insulation Trends was a thorough follow-up of the talk Austin Dunham, district manager, Anaconda Copper Co., gave last year to all three meetings. He brought up to date the changes in orders respecting use of rubber insulation, now prohibited except for certain cables and war uses. He told of the changed situation regarding neoprene and its scarcity now. Likewise, he discussed the electrical insulating characteristics of Buna-S, Buna-N, Butyl and Neoprene and the resins from which synthetic insulations are made.

The only prediction he would make was for more change. Probable uses of wartime developments in these insulations after the war were also conjectured by him. He spoke of the 1945 Code and said he believed several things would be recognized, a combined current rating table, for example.

Victor Moulton, secretary of the Rocky Mountain Chapter, is committee chairman for the IAEI postwar reinspection committee. He outlined the problem facing inspectors after the war. First there will be the "90-day wonder" electricians, given a training to do a single job only, wiring airplanes or ships. They will come back to wire homes and buildings but should be required to start as apprentices and should be taught their full trade. Temporary wiring jobs "for the emergency," or about five years, will need checking. Wiring of old buildings now obsolete also needs remodeling.

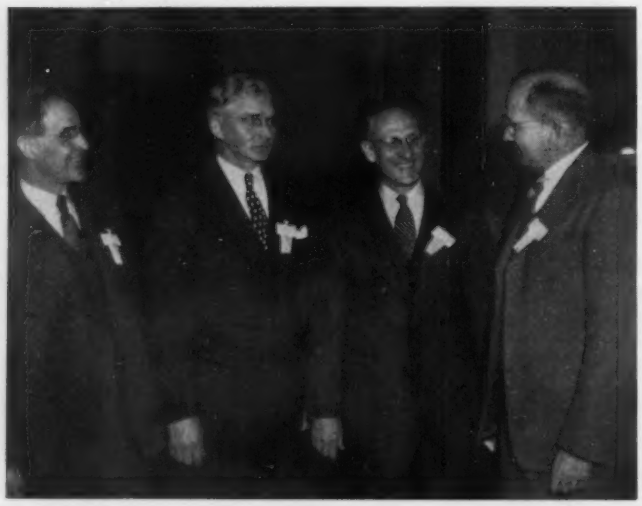
The questions of financing reinspection and of the legal right of the inspector to enter premises for reinspection are the two main obstacles. He told of the inadequacy of a fee system and urged discussion of the situation with the mayor and attorney of each town. One union, he reported, had offered to finance reinspection from its surplus funds as a means of providing postwar employment for its members.

He asked for suggestions and ideas for his committee. Tousley suggested that the committee lay out the situation first, then work for a solution of each individual problem. The necessity for diplomacy and for allowance of time for a property owner to make the required improvements was stressed too.

L. A. Barley, pioneer insurance inspector, now retired, was called on to visualize the future. He reached far into it to draw a vision of lighting without wires, appliances without cords, a single service to the house, radically different motors using much less current. While Code changes for these must await the actual realization of such dreams, he said he felt certain they would come.

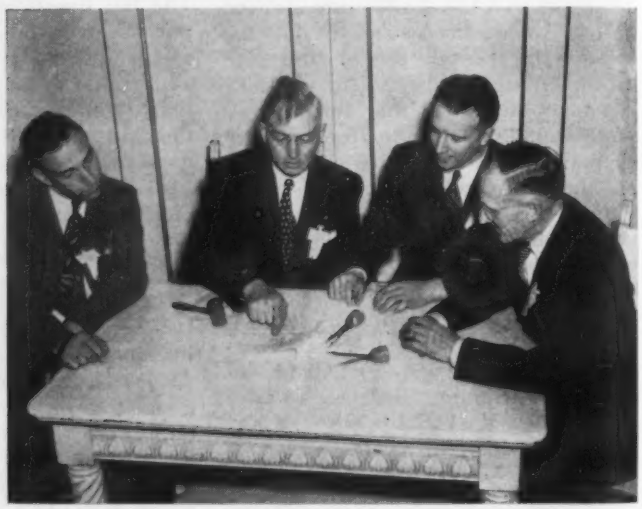
Major R. George Woods, Commander, U. S. Civilian Defense Corps, talked briefly, explaining how volunteer insurance inspectors have been called to make fire and accident inspections at war plants making war products in order to release military personnel formerly assigned such duty.

At the election of officers concluding the meeting, William Quandt, Southern Colorado Power Co., Pueblo, first vice-chairman, refused the chairmanship, and V. D. Markham, Colorado Springs electrical inspector, was elected chairman. First vice-president is D. G. Mulligan, of Mountain States Inspection Bureau, and second vice-president George R. Hubbard, Boulder, Colo. V. C. Moulton was re-elected secretary-treasurer. The executive committee consists of C. B. Farrah, Denver (past chairman); Hubbard; E. P. Hodges, Denver; Carl Simon, Lowry Field; Austin Dunham (Anaconda); Harold Vaughn, Denver; Tom Mackey, Colorado Springs; R. K. Foulk, Denver, and J. B. Gilmore.



Utah Chapter officers, R. E. Baxter, retiring chairman; D. J. Wolters, newly elected chairman; C. F. Grant, secretary and L. B. Johnson, chairman arrangements committee

New officers launch a new program; John Fisher, Provo, first vice-chairman; D. J. Wolters, chairman; Harold Morr, second vice-chairman; C. F. Grant, secretary-treasurer



Utah Specialties

Besides acting as chairman of the afternoon session A. E. Fleming, electrical engineer, Office of Service Command Engineer, 9th Service Command, Fort Douglas, presented a paper by E. E. Tugby, senior engineer, titled *Wartime Construction of Electric Utilities*. Arrangements are being made for publication of this paper soon.

It told of the problems involved in construction and maintenance in order to house quickly armies of men con-

stituting towns of 2,000 to 40,000 population; provide flexibility for expansion, and designs to use the minimum of critical materials. The account, though strictly factual, was dramatic in the challenge that was met so expeditiously by the cooperation of Army engineers and the electrical industry.

Housing was given special place on the Utah program when Gordon C. Weggeland, state director, FHA, talked. He announced that on Feb. 12 the critical list was amended to allow more outlets and that those placed back to back in a partition can be counted as one outlet.

Weggeland declared that FHA, as a policy, was anxious not to overbuild during the present period in order to leave as large a backlog of housing construction as possible for the postwar period. He also expressed the hope that the homes built during the war restrictions on materials would be furnished additional financing with which to bring them up to standard after the war. Electricity, he felt, was the greatest contributor to a high living standard.

Another feature of the Utah meeting was a talk from both a wholesaler and a contractor regarding their particular problems. E. M. Bogess, substituting for W. O. Smith, of General Electric Supply Corp., Salt Lake City, read an editorial *Or Equal* from *Electrical Contracting*, as indicating the need for adherence to quality materials. Wholesalers, he said, by necessity, must select lines more on a basis of their turnover than on quality. The responsibility for quality in materials lies with the engineer or architect who specifies and the contractor who installs. The inspector's responsibility is to see that the specifications are met and the job safely installed.

J. Vernon Sharp, electrical contractor of Salt Lake City, declared that inspectors were cooperating fully, and that if contractors experienced trouble it was probably because they failed to discuss their problems with the inspector before starting the work. Government agencies, too, he said, were cooperative if what a contractor presents is legitimate. Recently returned from a trip to Mexico, he contrasted conditions there with those here and showed the industry in U.S.A. to be benefited by price regulations and materials restrictions by comparison.

Major Earl J. Glade, of Salt Lake City, spoke with surprising awareness of the construction industry. He predicted that the men who return from foreign countries will bring back ideas to influence future architecture. He expressed a desire to build a civic center for Salt Lake City, but declared public works must be useful and must not bankrupt the town. He delegated to inspectors the responsibility of supervising the construction of the future.

Ending the Utah meeting with an inspirational message, George M. Gadsby, president and general manager, Utah Power Co., pointed to the dangers of centralized government. Frank Bodine, president, Electrical League of Utah, was toastmaster at the evening dinner. Using an electrical analogy, Gadsby said that it was more important for government to be the insulation, but that the current of American life and progress could best be carried if the conductor was free enterprise.

Gadsby was frank in criticising business management for having neglected to provide many of the social and security measures which government had forced upon business. The need for regulation by government was always to be expected. But the enterprise of the country could best be expressed by a free people.

At the election of officers concluding the afternoon business session, D. J. Wolters, chief electrical inspector, Salt Lake City, was named chairman of the Utah Chapter. John Fisher, chief electrical inspector of Provo, was elected first vice-chairman; H. S. Morr, Board of Underwriters, second vice-chairman; and C. F. Grant, Utah Power & Light Co., Salt Lake City, secretary-treasurer. Lester Johnson presented the chapter a gavel which he had fashioned from a locust insulator pin used on what is claimed was the first high-voltage transmission line in the world, from Provo to the Mercur mining district.

Secretary James Clune of Chinook and chairman John Crawford of Butte discuss the Montana Chapter meeting

Montana Specialties

A vision into the future electrical industry was brought to the Montana Chapter opening meeting, Friday evening, by D. J. McGonigle, general sales manager, Montana Power Co., Butte. Returned from a trip to factories and research departments of leading manufacturers, McGonigle swept rapidly through a list of postwar electrical uses which promise radical changes in home and business standards. Full text of McGonigle's talks is to be published in ELECTRICAL WEST soon.

Montana Power men who handled all the arrangements, Homer Morton and H. K. Dickinson, Great Falls division

He ended his stimulating prospectus of the future uses of electricity by pointing to the inadequacy of today's houses and buildings even to absorb the electrical loads of today, and the need for a well-organized wiring program after the war, promoted by the entire industry.

A code forum or panel discussion, initiated at the Montana Chapter last year, was again one of the livelier and more spontaneous features of the closing session. With H. A. Morton, Montana Power Co., acting as questioner, a panel consisting of the following answered the questions or argued them among themselves where differences of viewpoint arose. Members of the audience also added questions or arose to give opinions. The panel consisted of C. A. Palmquist, electrical contractor, Great Falls; R. C. Setterstrom, electrical engineer, Montana Power; A. A. Wells, REA, Fairfield; L. B. Johnson, General Electric Co., Salt Lake City, and H. G. Knoderer, G.E., Bridgeport; J. S. Mahan, representing Fustat manufacturers, Chicago; H. G. Ufer, Underwriters' Laboratories, Los Angeles, and O. A. Alderman, Bussmann Mfg. Co., Seattle. V. H. Tousley, IAEI secretary, also participated.

A list of 26 code questions had been proposed from questions sent in by members of the chapter. Time permitted discussion of only eight. Of these one was whether a 100-amp. entrance switch could really carry 100 amp. indefinitely, and why not? The others related to fuses and just what fuses were designed to protect, equipment or wiring. Since the abolition of No. 14 wire and use of No. 12 only for branch circuits is tied in with a proposal to establish a 20-amp. branch circuit as a minimum for residential occupancies, the question was hotly discussed.

Preceding the reading and passage of resolutions, it gave the resolution on No. 14 wire a struggle, but it was passed three to one.

In the concluding election the officers for the Montana Chapter selected were: Bruce Shavere, REA inspector, Lewistown, chairman; K. L. Chrysler, Billings, city engineer, first vice-chairman; A. J. Baker, Lewistown fire chief and inspector, second vice-chairman; and J. Clune, electrical contractor, Chinook, Mont., secretary-treasurer.

Montana Power men handled the entertainment and arrangements in typically hospitable fashion. Among those who were most active were H. E. Chambliss, Great Falls division manager, H. K. Dickenson, Homer Morton, R. McDonough, D. J. McGonigle and Robert Kerr.

"Sell Our Way Out" is RMEL Keynote

Denver conference of all industry league gives engineers, sales and accounting groups two days of idea swapping and inspiration

HERALDED as the most successful Spring Conference in the history of the Rocky Mountain Electrical League, nearly 200 members of that association met in Denver April 11 and 12, after a two-year wartime vacation, for a discussion of industry problems. The first day was devoted to parallel sessions of the Engineering, Accounting and Sales and Promotion sections, with the second day given over to morning and afternoon joint meetings of all three.

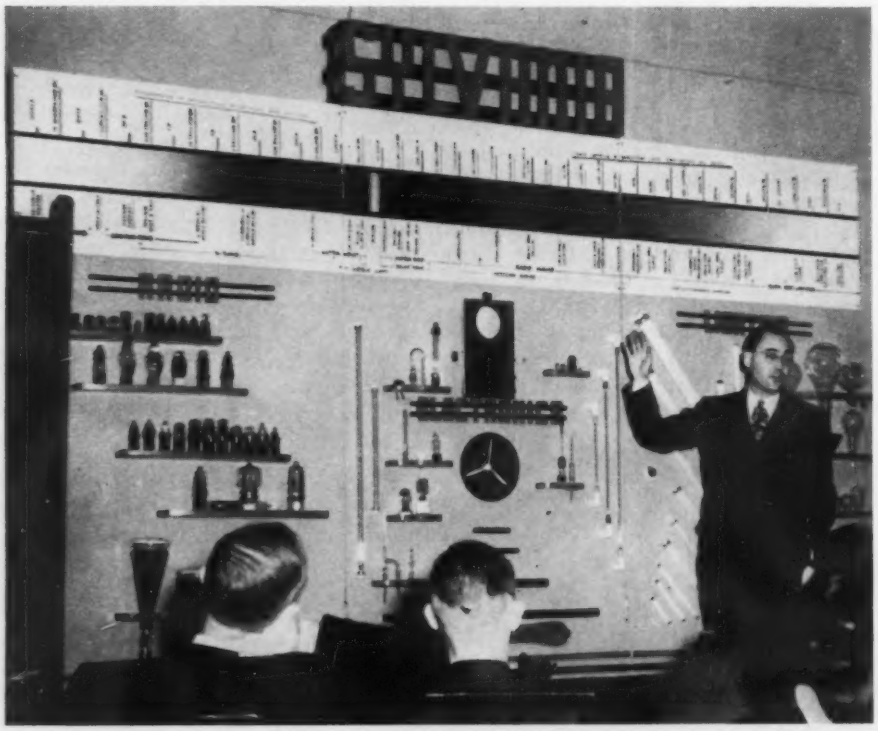
At a joint evening meeting with the Rocky Mountain Chapter of the Illuminating Engineering Society and the International Association of Electrical Inspectors, Don P. Caverly, chief engineer of Sylvania Electric Products, Inc., presented a splendid program which took some of the mystery out of electronics. Present and future applications in the various regions of the electro-magnetic spectrum were discussed and demonstrated with the aid of an elaborate display board containing more than 450 electronic tubes and devices.

Speaking before one of the joint meetings, G. B. Buck, vice-president, Public Service Co. of Colorado, struck a keynote when he said, "the only way out of this thing is to sell ourselves out. The most important job of our industry and that of every other business is to re-establish and preserve the private industry system. Otherwise, we will have no industry and no jobs."

"We must choose between going forward under regimented planned economy or going forward under private enterprise. If you do not make the choice, it will be made for you," he declared. The industry will be confronted with the greatest surplus power problem in its history and, speaking for his own company, his sales plans call for doubling his residential, commercial and industrial load "by noon of the first day" after the "go" signal. All of these things call for salesmanship and every industry man must be a salesman, he said.

F. F. McCammon, general superintendent, Public Service Co. of Colorado, comprehensively covered the subject of practical manpower economics. In his opinion, the uitility may just as well reconcile itself to losing all its men up to the ages of 29 or 30. Of the three branches of the business, service, administrative and commercial, it is the service or generation and transmission that must be kept going at all costs. Commercial and administrative have already been cut to the bone and even distribution can be cut some more, but generation and transmission are vital, for without them there would be no power. Women in power plants and substations have been of little help because of the technical nature of the work and the mechanical judgment needed in handling expensive machines and equipment. Economies have had to be thrown out the window for the duration and, in his opinion, it may be necessary to go to a 72-hour week of six, twelve-hour days to meet the increasing manpower shortage.

Earl Mosley of Colorado Springs said the worst competitor for manpower was the government itself which comes along and takes key men by paying them up to three times as much as they are getting. Girl meter readers were discussed and several operators are experiencing high turnover. K. W. Kissick, Trinadad, said that it takes three girls to replace two men and that accident rates with women meter



Don P. Caverly, Sylvania Electric Products, Inc., gave members of the Rocky Mountain Electrical League, Electrical Inspectors association and Illuminating Engineering Society a glimpse into the future of electronics with an elaborate display board and demonstration at an IES-sponsored joint dinner meeting

Attending the joint meeting of RMEL, IES, and IAEI (left to right): G. D. White, president, and R. H. Ervin, vice-president, Rocky Mountain chapter Allied Institute of Architects, Denver; R. N. Hankins, vice-president, Albert Sechrist Mfg. Co., Denver; J. A. Setter, G-E, Denver, and president Rocky Mountain IES; Don P. Caverly, Sylvania; C. C. Baker, president RMEL

readers are much higher, partly due to the fact that dogs seem to go for the girls' legs much more than for mens'.

Engineering

An interesting new type of rural line construction was described in a paper by E. B. Hornbaker, Southern Colorado Power Co. Where trees are a problem, they locate the common primary and secondary neutral of single-phase, 4-kv. primaries at the top of the pole and run the phase wire consisting of tree wire below. The Copperweld ground or neutral protects the phase wire mechanically and the type of construction has proved very satisfactory in a number of locations. Where services are tapped off, a ground wire is brought down the pole to a point below the phase wire.

Another type of construction they are using is to place the 4-kv. phase wire on a white porcelain secondary spool attached to the pole by a through-bolt. No trouble has been experienced from this overvoltage on the low-voltage spool and economies of construction have proved well worthwhile.

J. E. Wilson, Colorado Central Power Co., told of his company's revitalized program under which it has erected several spans of line and holds regular safety classes on company time. All types of construction and maintenance jobs are enacted, with the safety supervisor and those not engaged in the work acting as critics and judges. Practices are often modified as a result and incorporated in the safety manual.

A plea for power company cooperation to assist the manufacturers in heavy apparatus standardization was made by A. S. Anderson, G-E Company, to the end that the number of specials going through factories can be reduced and costs lowered.

A panel discussion with O. P. Reed, Cheyenne Light, Fuel & Power Co., as moderator dealt with wartime engineering and practices. Only two questions were discussed by the panel, one dealing with permissible wartime lower limits on customers' voltage and the other with distribution transformer testing practices. It was the consensus that about 10 volts below base should be the outside lower limit, providing customer voltage does not drop below 105 in any event. Use of maximeters for secondary testing of transformer loads was conceded to be a very satisfactory and inexpensive method of making load checks.

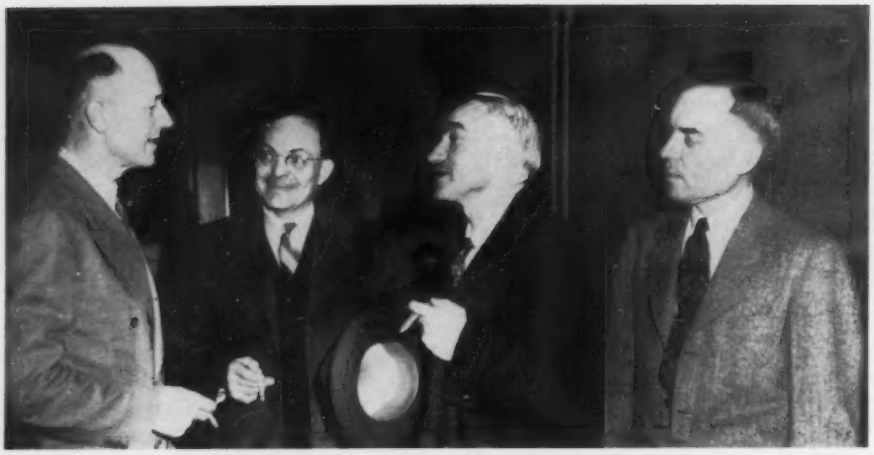
A paper on gas turbines, one on wartime transportation maintenance and a film on electronics rounded out the one-day meetings of the engineering section.

Accounting Section

Believe it or not, electric utilities long for a return of the good old days when males with dog-bitten legs were meter readers. This opinion was softly enunciated by J. H. Pitts, Home Gas and Electric Co., Greeley, Colo., in the course of his talk on *Periodic Billing Methods* before the Accounting Section at RMEL's Spring Conference in Denver. Pitts ventured his statement as a result of his organization's experience (1) with variations of REA's best ideas to get readings on customers' meters (2) with women meter readers and (3) with several other plans, none of which worked very well. Panel discussion, in which representatives of large power concerns participated, agreed with Pitts' conclusions for reasons well known to utility men: The men can "take it" with negligible absenteeism and they bring in the readings on which billings are based; they also are good customer contact agencies.

W. J. Benning, vice-president of Southern Colorado Power Co., presided over the accountants' sessions, opening the first day's discussions by presenting Harry Adler, Arvada Electric Co. (former section chairman) who visualized accountants as something (but not much) less than angels. He pictured them as the men who are responsible for bringing all the benefits of electricity to mankind—lighting the weary customer home from work; providing him with labor-saving devices and *human* services such as radio, with symphonies, comedy and educational features. Without accountants to keep the records straight and keep salesmen and engineers out of trouble, none of these services could be rendered, said Adler. He pointed out that the accountant's functions are now more manifold and important than formerly, what with government regulations (which he predicted will continue after the war), development of the electric industry, revision of rates, etc. He urged that accountants "come out from behind their ledgers" and cease to think of themselves as merely detail clerks. While he acknowledged that engineers considered all accountants as obstructionists, Adler classified them as "a desirable brake" to govern rates, merchandising and public relations, with a responsibility to provide ideas for broadened public service scientifically controlled.

S. B. Schwab, credit manager for Public Service Co. of Colorado, frankly acknowledged in his speech on *Postwar Credits and Collections* that he didn't know what over-all policy of the "front office" will be, come peace and a release of electrical civilian goods. He, furthermore, could not predict anything with accuracy without knowledge that Regulation W will (or will not) outlast the war. Dick Isaacs, Westinghouse Electric, who transferred, pro-tem, from the Sales and Promotion Division's meeting, stirred discussion over Schwab's subject by hoping vigorously that Regulation W —requiring one-third down and remaining payments soon—would prevail into the indefinite future. He was hissed down by accountants who believed that war savings will be exhausted about the time adequate electric goods can be turned out by manufacturers, glutting the market unless long-time credits can be applied. Schwab, having the last word after



From left: O. P. Reed, Cheyenne Light & Power Co.; F. H. Wiley, Colorado Springs Light & Power Dept.; W. D. Hardaway, Public Service of Colorado; A. S. Anderson, G-E Co., Denver

debate was quelled by the chairman—decided wisely that postwar credits will be controlled by conditions as yet unpredictable; that a shortage of consumer goods may prove to be inflationary; that the time may again come when the routine of accepting worn-out equipment as first payment on something new will prevail.

Sales and Promotion

Elsewhere in Denver's Cosmopolitan Hotel, the Sales and Promotion Section, under H. T. Rankin, met to chart a postwar course. E. E. (Ernie) Brazier, General Electric Supply Corp.'s regional manager, started the ball rolling with a demand that a committee be formed to formulate a postwar program. Informed that such a body had been at work for some time, Brazier launched into statistics citing the vast quantities of electrical merchandise needed to supply an avid public. Panel discussion revealed that families in rural areas have around $600 to $1,000 at hand to buy luxuries and necessities not now available (and city households, enriched by war earnings, are equipped with cash or war bonds in similar, or larger, quantity); that the electrical industry must plan ahead if it is to reap its share of this money crop. Chairman Rankin assured those present that the privately owned electric utilities have not been "asleep at the switch," which brought admissions from officials of smaller power concerns that they have postwar programs already in operation, insofar as conditions will permit.

Dick Isaacs, in his own domain this time, again starred with his hobby: *Merchandise Changes and Standardization*. He put himself on record as favoring standardization which would permit interchange of unit parts and facilitate sales. He declared, however, that, while manufacturers are naturally favorable to such standardization, field conditions require different designs for varied markets; that electrical leagues and similar organizations throughout the nation have it in their power to influence manufacturers. Whatever is done in this respect, he acknowledged, must be on a national basis; and, once more, Isaacs pled for a big down payment and the rest within a year.

The bugaboo of *Package Power Competition* was dealt with summarily by Paul E. Brookover, Public Service Co. of Colorado power salesman, on the ground that Diesel engines don't service themselves; that cost of electricity from an established company compares favorably with that of Diesels and carries with it the assurance of competent engineering service.

T. M. Foulk placed his finger on *The Bottleneck of the Entire Industry* in adequate wiring, which must be fostered on a huge scale if salesmen are to market their wares and engineers are to find an outlet for their power generating facilities.

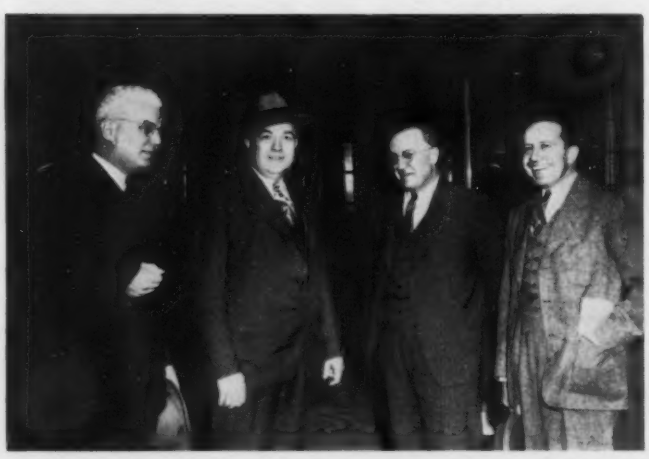
IES, Southern California Section, on April 5 had as its speaker one of its own members now in the armed services, Capt. Thomas A. Esling, USNR. Capt. Esling was formerly Southern California representative for Curtis Lighting, Inc., and more recently was lighting engineer for Southern California Edison Co. An Annapolis graduate, he joined the transport service before Pearl Harbor and made the run into Singapore with a group of troop reinforcements two weeks before its fall. His talk before the IES told of his experiences.

Modern Miracles in Glass were described to the San Francisco Electric Club at its April 3 meeting. D. F. Courtleigh, of Owens Corning Fiberglas Corp., Toledo, Ohio, sketched the development of glass from the time of Christ and discussed present and future uses for this product.

Light Metals—Postwar was the subject at the April 3 meeting of the Los Angeles Electric Club. T. E. Piper, chief materials and process engineer, Northrop Aircraft, Inc., was speaker.

Frank Angle, Pacific regional manager, Allis-Chalmers Mfg. Co., discussed the newly developed gas turbine at the April 17 meeting of the Electric Club of Washington, at Seattle.

From Public Service of Colorado were Frank S. Henderson, Boulder; G. B. Buck, Denver; Vernon Cato, Leadville, and George M. Stricker, Boulder, all RMEL standbys



Roy H. Ashworth, Utah Power & Light; J. A. Ballock, Western Colorado Power; Fred G. Hodge, Portland General Electric; G. O. Hodgson, G-E Lamp, Denver

PCEA *Panorama* — *Edited by Mary Shoop*

Meeting Programs

at San Francisco and Los Angeles in May

PROGRAMS for the two PCEA meetings, one at San Francisco on May 10 and the other at Los Angeles on May 18 are as follows:

FAIRMONT HOTEL, SAN FRANCISCO

May 10

9:00 a.m. to 12:00 noon, section meetings (see detailed programs below).
12:15 p.m., luncheon, F. C. Angle, presiding
1. Annual Meeting
2. Address, *A Businessman's Look into the Future of the Electrical Industry*. Speaker: Ernest Ingold, past president, San Francisco Chamber of Commerce.

2:00 to 5:00, section meetings (see program below)

BUSINESS DEVELOPMENT SECTION

P. P. Pine, *Chairman*
Milo Cain, *Vice-Chairman*

9:00 a.m.
1. Report of Code and Ordinance Committee, B. C. Hill, chairman.
2. Report of Adequate Wiring Committee, J. A. Hill, vice-chairman.
3. Report of Committee on Guarantees and Service Periods, F. U. Naylor, chairman.

10:30—*Agricultural Electrification*, Prof. H. B. Walker, Division of Agricultural Engineering, University of California, chairman of the California Committee on the Relation of Electricity to Agriculture.
11:00
Report on General Commercial Conference, EEI.
Report on Power Sales Conference, EEI.
Report on Meeting of American Chemurgic Council, R. E. Fisher, vice-president in charge of public relations and sales, Pacific Gas and Electric Co.
2:00—*A Report on Gas Turbine Development and Application*, F. C. Angle, Pacific regional manager, Allis-Chalmers Mfg. Co.
2:45—*Future Appliance Distribution*, B. W. Reynolds, manager, domestic sales, Pacific Gas and Electric Co.
3:45—*Lighting Tools for Tomorrow's Jobs*. A talk and demonstration by S. G. Hibben, director of applied lighting, Westinghouse Electric and Mfg. Co.

OPERATING ECONOMICS SECTION

E. A. Crellin, *Chairman*
E. W. Morris, *Vice-Chairman*

9:00 a.m.—*Pacific Coast Power Outlook*, George C. Tenney, president, McGraw-Hill Co. of California.
10:00—*Population and Load Forecasting for Effective System Planning*, J. D. Enefer, engineer, Southern California Edison Co.
11:00—*Labor Legislation, Its History and Trend*, L. J. Nevraumont, manager, personnel department, Pacific Gas and Electric Co.
2:00 p.m.—Joint session with the Business Development Section. *A Report on Gas Turbine Development and Application*, F. C. Angle, Pacific regional manager, Allis-Chalmers Mfg. Co.
3:00—*Modernization of Rotating Equipment*, O. A. Gustafson, district central station engineer, General Electric Co.
4:00—*Maintenance of Energized Lines and Equipment*, a color film presentation prepared by Howard Miller and O. A. Fishback, Southern California Edison Co.

A separate all-day session was held of the transportation group under the direction of E. C. Wood.

ADMINISTRATIVE SERVICES SECTION

F. C. McLaughlin, *Chairman*
H. A. Lee, *Vice-Chairman*

Joint session of accounting, materials and equipment, credits and collections, personnel, customer relations, law, insurance, taxes, valuation and finance groups.
9:00 a.m.
1. *Our Legal and Moral Obligations in Connection with Replacement of Employees Returning from Military Service*, Hance H. Cleland, president, San Diego Gas and Electric Co.
2. *New Techniques in Leadership—Training Preparation for Supervisorial Personnel*, Prof. C. R. Cook, University of California.

2:00 p.m.
3. Presentation of visual education through use of films by representative of Disney Studios.
4. Discussion of wartime customer relations problems. F. U. Naylor, chairman.

AMBASSADOR HOTEL, LOS ANGELES

May 18

9:00 a.m. to 12 noon, section meetings (see detailed programs below)
12:15 p.m., luncheon, F. C. Angle, presiding.
1. Report of Annual Meeting.
2. Address, *Approaching Victory*. Speaker: Verne Orr, vice-president, Chrysler Motors of California.

2:00 to 5:00, section meetings (see program below)

BUSINESS DEVELOPMENT SECTION

P. P. Pine, *Chairman*
Milo Cain, *Vice-Chairman*

9:00 a.m.
1. Report of Code and Ordinance Committee.
2. Report of Adequate Wiring Committee, H. C. Rice, chairman.
3. Report of Committee on Guarantees and Service Periods, C. L. Moore.

10:30—*Agricultural Electrification*, Prof. H. B. Walker, Division of Agricultural Engineering, University of California, chairman of the California Committee on the Relation of Electricity to Agriculture.
11:00
Report on General Commercial Conference, EEI.
Report on Power Sales Conference, EEI. R. C. McFadden, sales manager, Southern California Edison Co.
2:00 p.m.—*Future Appliance Distribution*, M. G. Sues, vice-president, Leo J. Meyberg Co.
3:15—*A Report on Gas Turbine Development and Application*, F. C. Angle, Pacific regional manager, Allis-Chalmers Mfg. Co.
3:45—*Lighting Tools for Tomorrow's Jobs*, a talk and demonstration by S. G. Hibben, director of applied lighting, Westinghouse Electric & Mfg. Co.

OPERATING ECONOMICS SECTION

E. A. Crellin, *Chairman*
E. W. Morris, *Vice-Chairman*

9:00 a.m.—*Pacific Coast Power Outlook*, George C. Tenney, president, McGraw-Hill Co. of California.
10:00—*Population and Load Forecasting for Effective System Planning*, J. D. Enefer, engineer, Southern California Edison Co.
2:00 p.m.—*Labor Legislation, Its History and Trend*, E. R. Perry, industrial consultant.

(Continued on Page 82)

Electriquiz

Charles P. Johnson, manager of the Western publicity division, Westinghouse Electric and Mfg. Co., San Franciso, provided the material for this interesting Electriquiz on the *Todays and Tomorrows* of electricity. See Page 106.

1. High-frequency heating, now making an outstanding contribution to the war effort in the reflowing of tin, will have what new postwar uses?

2. What is a possible use of ultraviolet light in food preservation?

3. Radiant heat lamps are speeding the drying of painted surfaces of tanks, jeeps, guns, shells and other war equipment. What are some of the possible postwar uses of these lamps?

4. A long and careful study has revealed a serious and major bottleneck to future home load-building programs. What is it?

5. Will radically different electrical equipment be available soon after cessation of hostilities?

6. What is the outlook for postwar home consumption of electricity?

7. Lean prewar days and wartime restrictions on construction have produced a housing shortage that must be met in what way after the war?

8. What industry was voted by the people, in a survey taken by the Psychological Corp., as the industry which gives people the most for their money and has done the most to raise the standard of living?

3:00—*Modernization of Rotating Equipment,* O. A. Gustafson, district central station engineer, General Electric Co.

4:00—*Maintenance of Energized Lines and Equipment,* a color film presentation prepared by Howard Miller and O. A. Fishback, Southern California Edison Co.

A separate all-day session will be held of the transportation group under the direction of Clarence Rhudy, California Electric Power Co.

ADMINISTRATIVE SERVICES SECTION

F. C. McLaughlin, *Chairman*
H. A. Lee, *Vice-Chairman*

Joint session of accounting, materials and equipment, credits and collections, personnel, customer relations, law, insurance, taxes, valuation and finance groups.

Subject: *All-Out Present and Postwar Thinking and Planning for Placement of Employees Returning from Military Service.*

9:00 a.m.

1. *A.G.I. Prologue,* presented by Lt. Charles H. Faulkner, Southern California Edison Co.
2. *Our Legal and Moral Obligations,* presented by Hance H. Cleland, president, San Diego Gas & Electric Co.

Questions and discussion.

3. *Problems Involved in the Public Utility Program for Fulfilling Those Obligations,* Rex Davis, manager of personnel, Southern California Gas Co.

Questions and discussion.

2:00 p.m.

4. *Problems Involved in the Manufacturers' and Wholesalers' Program for Fulfilling Those Obligations,* John J. McGilvray, veterans' employment representative for Southern California, War Manpower Commission.

Questions and discussion.

5. *New Techniques in Leadership:* Training Program for Supervising Employees, J. A. Long, Supervisor of Training, Southern California Edison Co.

Questions and discussion.

Lighting Talks

H. L. Logan, Holophane Co. engineering consultant and nationally known in the illuminating field, gave a series of lectures in San Francisco late in April and was scheduled to appear before the Los Angeles IES and the Los Angeles Electric Club in May.

Speaking at San Francisco before a joint meeting of the American Society of Safety Engineers and the Producers Council on April 26 and before the AIEE on April 28, Logan brought home the importance of lighting in accident prevention, quoting figures to show the degree to which visibility was a factor in the 3,000,000,000 manhours lost through industrial accidents since Pearl Harbor.

Brightness control and the effects of lighting on seeing was Logan's subject at a meeting April 27 attended by Bay District members of the IES, Sight Conservation Council and American Institute of Architects. He traced the evolutionary development of the eyes, their specific adaptability to environmental conditions, their limitations and how to create suitable artificial surroundings.

Control of architectural and illumination design by balancing of wall, floor and ceiling brightness for easier and more comfortable seeing is advocated by Logan. Slides used in his presentations were prepared following 10 years of research.

Who Am I?

I was born in Oakland on Feb. 27, 1898. At the age of five, I went with my parents to a ranch in the Oregon Willamette Valley, near Albany. I attended grammar school and high school there and enlisted in the Navy three days after World War I was declared. My experience included training on the battleship, *Oregon,* and I made several trips to France as a member of a gun crew on the transport, *Great Northern.* I transferred to the mine sweeper, *USS Owl* in July, 1918, and was honorably discharged with a rating of quartermaster first class in June, 1919. Who am I?

With my partner, F. B. Stone, I started in business in San Francisco in 1920 in a small shop that did motor repairs and industrial wiring. We have expanded into larger quarters three times. For many years, our greatest activity has been along the manufacturing line. We have developed and built a line of resistance welders, spot welders and band saw welders that have been distributed throughout the world. We also have made a large number of crane and hoist installations in the Bay area. Since 1941, practically our complete facilities have been absorbed in the building and repairing of electrical equipment for the Navy. I am general manager of our company, which is the Stone-Ryals Electric and Mfg. Co. Who am I?

I have been a member of PCEA for a number of years, was vice-president in 1940 and am now a member of the board of directors. I am a past president of the San Francisco Electrical Contractors Assn., the Electrical Contractors Assn. of Northern California, and the Electric Club of San Francisco. I am a member of the Olympic Club and the Family Club, enjoy golf, have a 22-year-old married daughter, reside in San Carlos and my name is: See Page 108.

Postwar Eyed

Problems confronting industry and government in war and postwar were brought before the Electrical League of Utah in recent addresses by George M. Gadsby, president of Utah Power & Light Co., and Earl J. Glade, Salt Lake City's mayor.

Gadsby stressed the necessity of keeping industry flexible, warning that "any limitation of freedom to the 'Four Freedoms' presupposes surrender of many guarantees of the Constitution and the Bill of Rights."

He divided the war period into four phases as follows: (1) construction and conversion of plants to wartime usage; (2) production of war materials; (3) combat stage (which we are now entering); (4) reconversion and re-establishment of peacetime economy. "Success of the coming invasion will determine whether we will go forward to reconversion or backward to the production stage of our wartime progress," he declared.

Urging understanding between all component parts of industry — labor, management and owners — he pointed out that no one of them can prosper without all of them prospering.

Glade stated that it would be a matter of serious concern if the present dearth of quality building materials and a corresponding inspection letdown were later to prove responsible for devastating fires, and reported that Salt Lake inspectors are required to be particularly vigilant during these critical times.

In outlining the city's postwar planning, Glade remarked that "everybody and his brother has a postwar plan" and the job is to sort out the best. He told of a city survey in which it was found that there are 7,300 homes without refrigerators and 1,734 without radios; stated that this "is just an indication of the prospects for the future of the electrical industry in Salt Lake City."

● SGT. BEN WARNER, formerly employed by General Cable Corp., and also subsequently by the Secret Service Division of the United States Treasury, addressed the East Bay Electric Club April 24.

School lighting was the subject and Prof. Willibald Weniger, Oregon State College, the speaker at the April 17 meeting of the Oregon Chapter IES. On May 1 Sam G. Hibben, director of applied lighting for Westinghouse Lamp Co., Bloomfield, N. J., was featured speaker. Another recent meeting of the chapter emphasized adequate street lighting. Speaker at this meeting was R. M. Swetland, application engineer, street and highway lighting, General Electric Illumination Laboratories, Schenectady.

C-D CAPACITOR SPECIALISTS

30 KVA 230 Volt or 60 KVA
460 Volt 3 Phase 60 Cycle
Indoor Enclosed Capacitor

CAN SOLVE YOUR POWER PROBLEMS TODAY

If your present facilities cannot supply your power needs, if you want to improve your voltage, C-D power factor specialists can solve your problems today. Low power factor wastes existing facilities and may cause excessive power bills. C-D capacitors will boost power factor, releasing transformer and circuit capacity. They will also increase the working load capacity of the entire system.

Compact, easy to install, Cornell-Dubilier capacitors are less expensive than additional electrical distribution equipment, they require a minimum of critical man hours and materials.

Case histories prove that C-D capacitors keep paying dividends long after they have paid for themselves. We invite your inquiries. Cornell-Dubilier Electric Corporation, South Plainfield, New Jersey.

There are more Cornell-Dubilier Capacitors in use today than any other make.

MICA • PAPER • DYKANOL WET AND DRY ELECTROLYTICS

Cornell-Dubilier

capacitors FOR POWER-FACTOR IMPROVEMENT

1910 CD CORNELL-DUBILIER CAPACITORS 1944

Now YOU CAN ORDER

5905 Page 6
May 3, 1943

UNIT SUBSTATIONS

REPETITIVE-MANUFACTURE

MASTER UNIT SUBSTATIONS

13.2 Kv–66 Kv Primary Voltages
4.33 Kv *or* 2.5 Kv Secondary Voltages

BASIC SPECIFICATIONS FOR UNIT ARRANGED AS IN FIG. 10

Unit Substation Rating

The outdoor unit substation will have the following rating in accordance with the Standards of the American Institute of Electrical Engineers:

Capacity ..... ("t") Kva
Frequency ..... 60 cycles
Phases ..... Three
One incoming three wire 13.2-66 Kv circuit
Two outgoing three wire 2500 volt or four wire 4330 volt circuits.

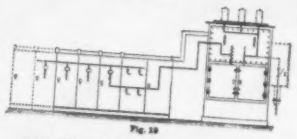


Fig. 10

The Outdoor Unit Substation Will Consist of the Following Co-ordinated Parts:

Transformer Section with

Three-phase transformer oil-filled rated ("t") kva self-cooled (55 C rise), 60 cycles with ( ) kv high voltage and 2500-volt delta or 4330-volt grounded wye low voltage.

The transformer section shall be provided with:

Cover bushings
Three-element winding temperature equipment
Standard accessories
Sealed tank construction
1500 kva and below at voltages 34.5 kva and below. Gas-oil seal all other ratings.
Two 5% *rated kva taps below normal rated high voltage with externally operated manual tap changer

All details will be in accordance with the applicable sections of the Proposed Standards of the ASA, dated March 1940.

If specified, automatic tap-changing equipment will be furnished which will operate under load to give 8 approximately 15/16% taps above rated secondary voltage; and 8 approximately 15/16% taps below rated secondary volts at a current equal to the transformer current at rated kva and rated secondary volts. This equipment will include a contact-making voltmeter, line-drop compensator, necessary auxiliary control mounted in a weatherproof steel compartment.

The transformer section low-voltage bushings and metal throat will be properly co-ordinated to bolt together with the feeder switchgear section in the field.

Feeder Switchgear Section with One Auxiliary Compartment containing:

1—Hinged steel panel.
1—Relay, auxiliary, with automatic-reset contacts, and hand-reset target, connected to the transformer-temperature relay for tripping the transformer-secondary circuit breaker in case of excessive transformer winding temperature.
1—Watthour meter with indicating demand register.
1—Voltmeter and transfer switch.
3—Potential transformers, 2400/120-volt, 200 kva with fuses of the current-limiting type.
1—Control-power transformer for closing circuit breakers, oil-cooled, single-phase, 5 kva, 2.3 kv, 230/110 v with fuse of the current-limiting type.
1—Storage battery for breaker tripping 24-v sealed-in-glass jar type, consisting of two six-cell units having a suitable discharge rate to a final voltage of 1.67-v per cell.
1—Copper oxide battery charger with ammeter, cut-off switch, and variable resistor.

One Transformer Secondary Breaker Compartment with

1—Power circuit breaker, vertical lift type, TPST, ("q") amp, ("p") kva interrupting capacity, 220-v, a-c rectifier solenoid-operated with 24-v, d-c potential trip coil, necessary auxiliary switches, latch-checking switch and control relay.
1—Hinged steel panel.
2—Relays, overcurrent induction type with inverse-time characteristics for back-up short-circuit protection. Operation of these relays will trip all power circuit breakers in the unit substation.
1—Circuit breaker control switch, with red and green indicating lamps and maintaining contacts.
1—Relay, reverse power, for tripping the transformer breaker on reverse power faults.
3—Relays, overcurrent, induction to provide the above reverse power relay with overcurrent time-delay characteristics.
1—Reclosing relay, for reclosing the transformer secondary breaker upon the restoration of normal three-phase voltage of proper phase rotation at the power transformer secondary.
1—Control-power transformer for closing circuit breakers, oil-cooled, single-phase, 10 kva, 2.5 kv, 230/110 v with fuse of the current-limiting type.
1—Control-power switch.
3—Current transformers.
2—Potential transformers, 2400/120 volts, 200-volt-amperes, with fuses.

Two Feeder Breaker Compartments *each* with

1—Power circuit breaker, vertical lift type, TPST, ("s") amp, ("r") kva interrupting capacity, 220-v, a-c rectifier solenoid-operated with 24-v d-c potential trip coil, necessary auxiliary switches, latch-checking switch, and control relay.
3—Current transformers.

Provision for terminating one outgoing feeder cable.

1—Hinged steel panel.
1—Ammeter and transfer switch.
3—Relays, for overcurrent and short-circuit protection, induction type, with inverse-time characteristics and instantaneous element.
1—Reclosing relay, 3 shot.
1—Circuit breaker control switch, with red and green indicating lamps and maintaining contact.
1—Control-power switch.

Accessories consisting of

1—Transfer truck for the circuit breaker removable units.
1—Set of control jumpers for operating the circuit breakers in the disconnected position.
1—Emergency-manual-operating handle for the circuit breakers.
1—Manual handle for operating the circuit breaker isolating mechanism.
1—Inspection rack (when required) for the circuit breaker, with provision for electrical operation of breaker and for removing the breaker tank.

"p", "q", "r", "s" and "t" refer to Table A Page 7.

* This applies to units with load ratio control, units without L.R.C. will have 4-2½% rated kva taps, two above and two below rated high voltage.

Supersedes issue dated Aug. 1, 1942. Minor changes.

Item		
1	Circuit Breaker Accessory House, Add	$ 600
2	Omit Automatic Reclosing (3 shot), Deduct per Feeder	1075

Units ***arranged differently*** in ***any*** respect from those above ***cannot*** be priced from the above schedules. ***Approximate*** prices for units varying in any way shall ***at least ten per cent add***

UNIT SUBSTATIONS

REPETIT
MASTER
Outdoor, Network or Radial Types—Net Pri
Primary
Secondary Vo

Cat. No.	Unit Substation Kva "t"	TRANSFORMER SECONDARY BREAKER "p" Interrupting Rating (Kva)	TRANSFORMER SECONDARY BREAKER "q" Current Carrying Rating (Amps)	TWO-FEEDER CIRCUIT BREAKERS "r" Interrupting Rating (Kva)	TWO-FEEDER CIRCUIT BREAKERS "s" Current Carrying Rating (Amps)	4.6-15 Kv PRIMARY VOLTAGE L.R.C.*	4.6-15 Kv PRIMARY VOLTAGE No L.R.C.
						A	B
US1N12	750	50	600	50	600		$13500
US2N12	1000	50	600	50	600		13650
US3N12	1500	50	600	50	600		13650
US6N12	2000	100	600	100	600	$17070	15440
US5N12	(4.3 kv) 2000	100	600	100	600	20130	16158
US6N12	(2.5 kv) 2000	100	600	100	600	22073	17070
US7N12	(4.3 kv) 3000 (Only)	150	1200	150	600	27450	21043

* L.R.C. is abbreviation for "Load Ratio Control"

† Eastern Zone is defined as any railroad freight

of Montana, Wyoming, Colorado, New Mexico, and

(*Western Zone*) *additions.*

(2)These units are arranged for *either* 2.5-kv or 4.3

desired so that the unit will be reconnectable in the

addition must be added to the 2.5-kv unit.

*Insert in place of the t, the letter "A," "B," o

particular unit chosen.

If more than two feeders are specified change

feeders.

of the transformer secondary breaker is omitted

TABLE B

OUTER CIRCUIT BREAKER RATINGS‡

Item	
1	To increase a 50MKVA, 600 amp Breaker to a 100MKVA, 600 amp Breaker. Add $700 for the 1st breaker plus $4 per breaker for each additional
2	To increase a 100MKVA, 600 amp Breaker to a 150MKVA, 600 amp Breaker. Add $ per Breaker
3	To increase a 150MKVA, 600 amp Breaker to a 250MKVA, 600 amp Breaker. Add $ per Breaker
4	To increase a 100MKVA, 1200 amp Breaker to a 150MKVA, 1200 amp Breaker. Add $ per Breaker
5	To increase a 150MKVA, 1200 amp Breaker to a 250MKVA, 1200 amp Breaker. Add $ per Breaker
6	To increase a breaker rating other than listed add the difference between the number of increases to obtain the desired size.

‡All Power Circuit Breakers in a unit must have the KVA interrupting ratings. Current-carrying ratings may be d

TABLE D

LIGHTNING ARRESTERS‡
(Set of 3 mounted on transformer)

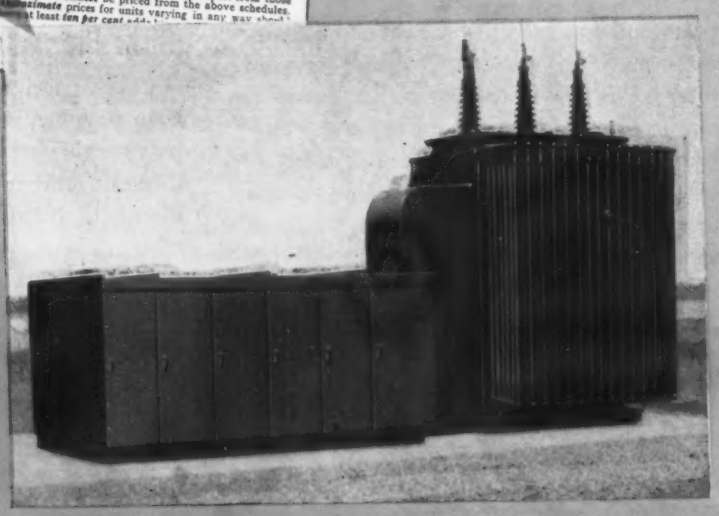
Item	Primary Voltage	DISTRIBUTION-TYPE Grd Neut	DISTRIBUTION-TYPE Ungrd Neut	STATION-TYPE Grd Neut	STATION-TYPE Ungrd Neut
1	13.2 Kv	590	661	$ 590	$ 661
2	22 Kv	590	661	590	661
3	33 Kv	590	661	590	661
4	44 Kv	635	671	635	705
5	55 Kv	679	705	679	749
6	66 Kv	705	705	1140	1230
7				1140	1230

‡Lightning Arresters cannot be mounted on the covers of transfor ers arranged for cable entrance.

General changes since Aug. 1, 1942 issue.

5270 51. 8c

PRICES SUBJECT TO CHANGE WITHOUT NOTICE



THIS 5000-kva unit substation with five feeders was ordered by a large war plant simply as "One Cat. No. US7J5 unit substation." The weeks of time and hundreds of dollars saved by the "one catalog number" method of ordering, to get a substation installed and operating sooner, is one of the many examples of planned efficiency in the war effort.

A COMPLETE SUBSTATION BY ONE CATALOG NUMBER

—a result of standardization and repetitive manufacture*

What G-E *unit substations* offer you:

LOWER CAPITAL INVESTMENT. Unit substations have opened a profitable new field for electric-service company distribution engineers who right now are studying their systems with a view to avoiding unnecessarily large capital expenditures. The valuable time normally spent in worrying about substation-design details can now be much more profitably devoted to ***system*** engineering and planning.

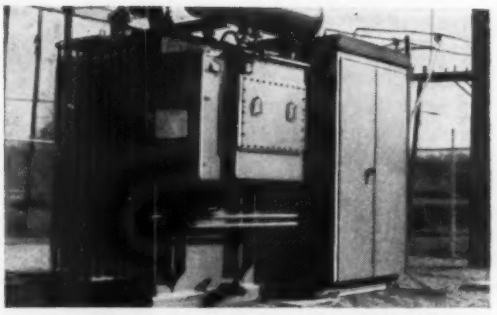
BETTER SYSTEM OPERATION. A well-planned system, one which has completely automatic, standard ***unit substations,*** means fewer customer outages, better voltage conditions, and a lower equipment-failure rate. The dispersal provided by a number of smaller units, compared with one large, central substation, localizes troubles and prevents huge equipment losses as well as large-area outages resulting from fires, explosions, or other misfortune.

GREATER FLEXIBILITY. *Shifting* loads are easy to follow because these standardized units are relatively easy to move. ***Increasing*** loads are easy to handle by purchasing additional units as they are needed. This precludes the possibility of installing a large substation and waiting for a load which may never develop.

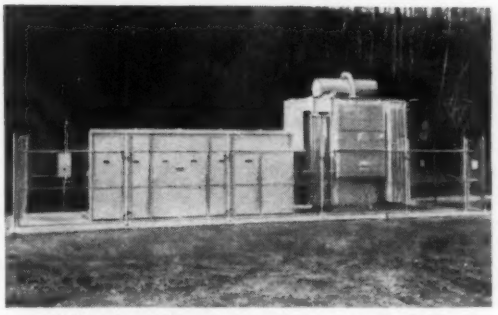
LOWER OVERHEAD. G-E *unit substations* are shipped directly to the installation site in completely assembled sections. You save the time and expense of passing hundreds of parts through stockroom or warehouse. You avoid the confusion of lost, delayed, or forgotten parts and duplicate pieces, rush orders, and consequent rehandling. Installation is always much easier and faster than it is with a piecemeal substation, and there can be a more efficient use of man power. Crews quickly become familiar with them because there are only two or three pieces to handle.

CENTRALIZED RESPONSIBILITY. The combined and co-ordinated efforts of General Electric's substation, transformer, switchgear, relay, meter, and application engineers assure the fulfillment of your specifications. The constant efforts of this highly trained group mean continued improvements in available standard unit substations—with lower and lower costs.

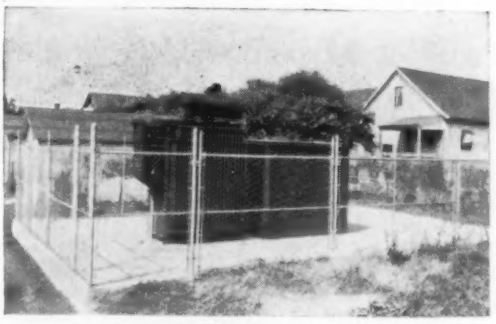
**** G-E unit substations are now being built repetitively from standard components for almost any application you may have. Ask your G-E representative for Bulletin GEA-3800, or for a detailed presentation of our complete line in the light of your specific problem. General Electric Company, Schenectady, N. Y.***



1000-kva unit substation—Cat. No. US2A1



1500-kva unit substation—Cat. No. US3A2



3000-kva unit substation—Cat. No. US5NE4

GENERAL ELECTRIC

302-50-5900

UNIT SUBSTATIONS

Every week 192,000 G-E employees purchase more than a million dollars' worth of War Bonds.

NEWS of the industry

PUC ASKED TO RESTRAIN REA FROM ENCROACHMENT

Colorado's Public Utilities Commission is now studying a complaint filed by Public Service Co. of Colorado alleging that the Sangre de Cristo Electric Assn. Inc. threatens to encroach on the private utility's properties and business in Chaffee County (at Salida, Colo.)

Public Service company now sells energy to Sangre de Cristo Assn., a federally sponsored rural electrification enterprise. The complaint states the REA unit is planning to parallel and intersect Public Service company's existing utility lines between its plants No. 1 and No. 2 in Chaffee County and Salida, and to connect with prospective customers within 300 ft. of the company's present lines — an alleged violation of an agreement whereby neither concern would duplicate the electrical services and facilities of the other.

The PUC is asked to restrain Sangre de Cristo from carrying out its plans and stipulate Public Service company's area, defining its limits in the Salida district. Public Service's complaint asserts the REA affiliate has been "exercising the rights of a public utility without regulation by the public utilities commission."

Puget Sound Turns Down $90,000,000 Purchase Offer

Withdrawal of Skagit County PUD as a party to the proposal, formal rejection of the $90,000,000 bid for Puget Sound properties by the utility's directors, and resignation of Bonneville Administrator Paul J. Raver as negotiating agent were developments last month in the joint PUD-Bonneville-Seattle City Light program to buy the private utility system in its entirety.

Skagit County PUD, one of the original supports of the plan, in a paid advertisement in the Mount Vernon, Wash. daily paper stated that, in joining the movement, it had set a definite time limit on the negotiations and that time limit had expired. The PUD commissioners also expressed themselves as against federal control of the entire power business of the northwestern states.

This stand was supported by the Skagit County Pomona Grange, whose master, Bert L. Heggen, declared the issue "now clearly one of state versus national government." PUD Commissioner G. C. Duvall stated at a grange meeting, "Bonneville's plan does not meet our approval and we do not advocate putting the government into this business, nor do we support the theory of control in the East.

In rejecting the $90,000,000 purchase offer, Puget Sound directors said the offer "did not constitute a valid proposal and the price named was grossly inadequate."

Following refusal of Puget Sound to consider the offer, Raver asked the Seattle City Council to relieve him of his duties as the city's agent in the negotiations. "In view of the position taken by the company, it is apparent that they are now not willing to negotiate for the sale of their property on any reasonable basis," Raver declared.

Friendly Suit to Prove Validity of Bond Issue

Acting in accordance with an Arizona state law, the Salt River Valley Water Users Assn. recently caused a friendly suit to be filed in Maricopa County Superior Court to establish the validity of $7,332,000 in refunding bonds which the association plans to issue through its fiscal agent, the Salt River Project Agricultural Improvement and Power District.

Officers of the association explained that the refunding issue will retire bonds callable in 1948 and that the exchange will react to the benefit of the association through a saving of about 1½% interest per annum after that date. The bonds to be retired carry 4 and 4¼% interest. The proposed refunding bonds will be callable in 1964.

● CONSTRUCTION of a 140-mile power line to transmit electricity from Fort Peck, Mont., to a point on the system of Montana-Dakota Utilities Co. at Glendive has been approved by the War Production Board, it was announced recently. The line would conserve natural gas by replacing gas steam-generated power with hydrogeneration to supply low cost power for irrigation pumping, according to William E. Warne, assistant commissioner, USBR.

● SOUTHWESTERN PUBLIC SERVICE Co., Carlsbad, N. M., has been granted a 25-year franchise by the city, with the proviso that the company will pay to the municipality 2% of its gross receipts.

OWNERSHIP OF LINE IS DEBATED IN PORTLAND

Portland's City Council on April 28 denied Bonneville the right to construct a power line into the city. Following this action, PGE received a WPB preference rating for materials, and construction of the $250,000 line has been started.

Request of the Bonneville Power Administration for permission to build a 115,000-volt transmission line into Portland's west side industrial district was contested last month before the city council.

Portland General Electric Co. also seeks to build the line, which would deliver Bonneville power into the PGE system.

Climaxing a disagreement between Bonneville and the private utility as to which organization should build and own the line, both agencies applied to WPB for preference rating and allocation of materials. WPB gave Bonneville priority for the section which would connect the St. Johns-Oregon City line with a Bonneville substation at NW. Yeon Ave. and St. Helens Road. Portland General Electric was authorized to build the section from the substation to its Station E.

In giving the authorization to Bonneville, WPB stipulated that it was based on Bonneville's ability to secure a city franchise by May 1 and complete the line before July 1 to avert use of oil for generation this summer.

J. A. Krug, OWU director, later stated that, "from the standpoint of the war effort, which is the only concern of the War Production Board, it is a matter of indifference as to which agency builds and owns the facilities in question."

In a report to the council, Commissioner Dorothy McCullough Lee recomended that, if the line were to be built, it be built by the private utility, which has a franchise and over which the city has direct control.

● SALE of Utah Light and Traction Co. properties by Utah Power & Light Co. last month awaited approval of regulatory bodies. The sale is in conformance with an SEC order accompanying approval of the company's refinancing plans. A new company, Salt Lake City Lines, is being formed to purchase the holdings.

ALL OVER THE MAP...

THERE'S A Federal MAN NEAR YOU!

More than ever before, service to customers is vital. Sound representation, strategically located, is an important factor in attaining this end. Fifteen nationwide branches of Federal, staffed by men who know your needs and are skilled in the knowledge of what our products can do for you, are at your call.

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You cut out waste motion when you use the Fargo Connector. It's built as one unit, free from loose parts, and *always threaded.* No time lost starting a nut, no chance of cross threading.

Re-use the Fargo Connector, again and again. With its rugged Everdur body and Duronze bolt, the Fargo Connector "grips like a vise" every time.

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EXPERTS PREDICT LOW WATER IN THE COLUMBIA

A critically low flow of water in the Columbia River during the approaching summer months was predicted at a recent meeting in Portland of the Columbia Basin Interstate Water Forecast Committee.

Representatives of 50 governmental agencies, power companies and agricultural groups from Washington, Oregon, Idaho and British Columbia participated in the meeting at which prospects for all types of water users in the vast Columbia watershed area were appraised.

J. C. Marr of Boise, who makes the entire basin prediction for the SCS division of irrigation, forecast that the summer flow of the river at The Dalles, Ore. measuring station will be 66 million acre-ft. between April 1 and Sept. 30. This flow will be the equivalent of only 59% of that of 1943. Record low flow was 56,430,000 acre-ft. recorded in 1926.

Elmer Fisher of the U. S. Weather Bureau at Portland predicted this year's peak flow will be only 315,000 sec.-ft. at The Dalles, as compared with 546,000 last year. Fisher said the peak will be even less than his estimate if Grand Coulee reservoir is not filled by the first week in June.

● To SAVE vitally needed fuel oil, Pacific Gas and Electric Co. will increase the use of natural gas for steam power generation, it was announced last month. By building connecting lines to the Rio Vista dry gas fields in the Sacramento Valley, gas consumption in the company's steam plants will be stepped up from 27,000,000,000 cubic feet last year to 62,000,000,000 cubic feet. It is estimated that this will release 10,000,000 barrels of oil.

● BELOW NORMAL precipitation and a 75% of normal snow pack in the Sierra was recorded by the California Department of Public Works in its principal snow survey bulletin issued in April. Uneven distribution of the pack, ranging from 60 to 93% of normal, with greater shortages in the northern section of the state, was reported.

● NEW MEXICO Public Service Commission approval was denied the City of Farmington, for purchase of power facilities outside its corporate limits. The city wished to acquire the San Juan division of the New Mexico Public Service Co., discard of the North Continent Utilities Co. Some of these facilities are located outside the city limits.

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Practically all your small transformer needs are supplied by the Complete Jeffries line. We have specialized for years in providing transformers to exactly match your requirements. If not in our regular line, we build to meet your specifications—in a hurry!!

Minimize your voltage losses. Specify scattered transformers to eliminate duplicate conduit runs, and save on power costs.

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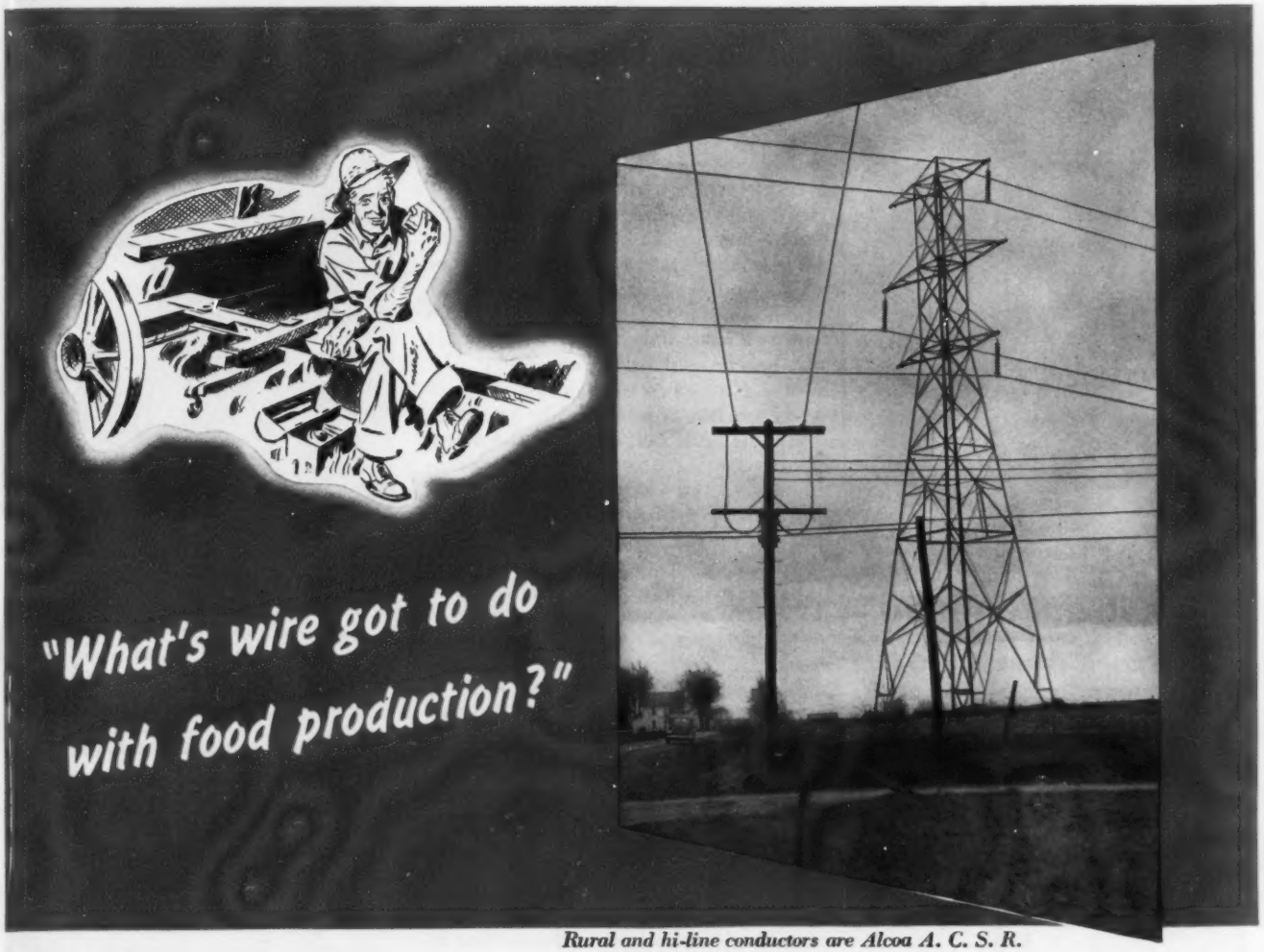

Rural and hi-line conductors are Alcoa A. C. S. R.

The electricity flowing in those two lines is headed in different directions. To the city, where it drives machines that fabricate the equipment our fighting men must have. To the country, where it helps the farmer produce the foodstuffs the whole world is needing. Both are vital war production.

Recognizing that rural lines and hi-lines, alike, must be kept working at top efficiency, power conductors and fittings were long ago made available for emergency work.

If you're planning to extend existing lines, install conductors of sufficient size to deliver *all* the power that's needed. Otherwise you handicap the man who is counting on using electricity to replace workers who have gone to war. A.C.S.R. provides the desired combination of high electrical conductivity, high strength and resistance to corrosion.

Alcoa engineers will gladly assist on your line maintenance and construction problems. ALUMINUM COMPANY OF AMERICA, 2132 Gulf Building, Pittsburgh 19, Pennsylvania.

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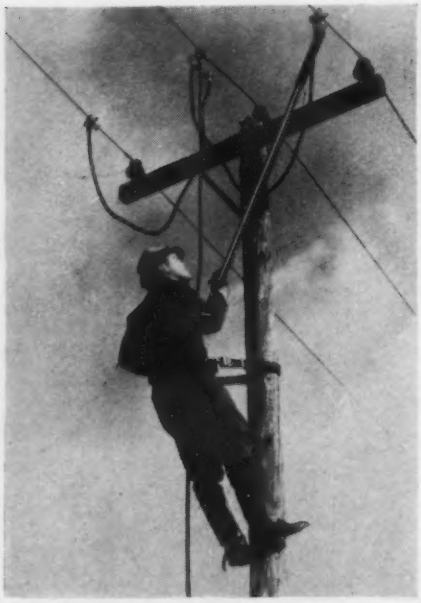


Linemen are entitled to the protection of . . .

TIPS GROUND SETS

Linemen making repairs on supposedly "cold" lines are entitled to the best grounding protection you can give them and the pages in your Tips Tool catalog will present to you the best that money can buy.

A typical example is the grounding set shown above, designed for 3 wire construction. 4/0 stranded copper to 3/0 ACSR, maximum conductors. This set is applied with a Grip-All clamp stick, shown at left. (One such set should be placed on each side of the location where men are working.) All cable contacts are tightened by pressure clamps before application. Eye screws are easily manipulated with Grip-All or other clamp sticks and tighten quickly on the conductors. There are no hazardous loose contacts as in the case of grounding chain. This same set is available with poles mounted ready for application.

This is only one of a half dozen different grounding sets shown in your Tips catalog. All are available either mounted or unmounted. You will also find a wide variety of clamps and accessories. Consult this book or your electrical jobber. There's no need to risk inferior equipment when Tips Grounding Equipment is still available. "There's nothing too good where life is at stake."

A·B·CHANCE CO. CENTRALIA MISSOURI

UTILITY CUTS DENVER COMMERCIAL RATES

Beginning with May bills, Denver's small commercial electrical customers will benefit some $260,000 monthly, as a result of an agreement between the city's mayor, the city council and Public Service Co. of Colorado. The old demand system of billing (under which connected load was a factor) will be charged to the consumer. Dotem whereby only metered kilowatts will be charged to the consumer. Domestic customers and industrial concerns are not affected by the change.

Another rate cut, affecting the municipality itself, was announced simultaneously: The city's street lighting bill is to be arbitrarily reduced $150,000 during the coming year—a credit of $12,500 per month to be allowed until the maximum amount is reached. A "gentleman's agreement" will probably place this sum in the city's fund earmarked for completion of Denver's extensive street lighting program, at least John E. Loiseau, Public Service Co.'s president, expressed a hope that such arrangement would be made.

The rate cuts followed negotiations which have been in progress since Public Service company's last reduction became effective two years ago. Denver officials were not satisfied at that time, due to the fact that small commercial users were not aided in proportion to other utility customers.

The matter of crediting the municipality with the monthly payment stems from Denver's contract with Public Service company, whereby certain costs in connection with a street light modernization program were allocated. The city is understood to desire a revision of these cost allocations and the compromise resulted.

Bonneville Announces New Wholesale Rate Schedule

A new wholesale power rate for Northwest public agencies purchasing Bonneville power has been approved by the Federal Power Commission, it was announced recently by Bonneville Administrator Paul J. Raver.

Public agencies which have no generating capacity will save from 15 to 30% of their power costs under the new rates, it was stated. Wholesale service will be as low as 2.5 mills per kilowatt-hour.

Dr. Raver said the new rate is expected to stimulate reclamation and irrigation of land for war and peacetime uses and to encourage other postwar uses for electricity, particularly in home appliances and house heating.

Although this may look like a new species of tank, it's really a part of a new installation for Boulder Dam. Twin exciters for an 82,500-kw. waterwheel generator, the equipment is ready for shipment from G-E's Schenectady plant

Rate Dividend Plan Adopted By Pacific Power & Light

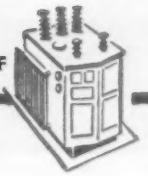
Under a rate dividend plan approved by Oregon and Washington regulatory authorities, Pacific Power & Light Co. will share wartime earnings with electric customers. Totaling $300,000, the rebate will amount to approximately one half an average monthly bill for each user. All classes will share.

The wartime rebate plan, which has been used in British Columbia and elsewhere in the United States and Canada, was characterized by Oregon Public Utilities Commissioner George H. Flagg as a practical method of distributing abnormal earnings without upsetting rate structures developed for peacetime conditions.

● CONTINUING the controversy surrounding Portland General Electric Co. rates, complaint of Public Utilities Commissioner George H. Flagg against the company will be heard at Portland on May 15. The complaint charges that PGE rates in seven Oregon counties are unjust and discriminatory.

An emergency order reducing the rates was issued by Flagg last December, following a breakdown of negotiations between the commission and the utility. The company asked for and secured a temporary injunction but the order was later declared valid in the Marion County circuit court. A utility appeal is now pending in the state supreme court.

AN OUTSTANDING WESTINGHOUSE CONTRIBUTION TO GREATER CONTINUITY OF POWER SERVICE



a "straight-jacket"

that tames high-current stresses

The terrific mechanical forces induced by a short circuit tends to distort and crush the coils in a power transformer. Westinghouse engineers use the shell-form core to reduce these stresses. It surrounds the coils like a steel "straight jacket".

Coupled with such Westinghouse developments as *Hipersil**, loading-by-copper-temperature, forced-air and forced-oil cooling, the shell-form design permits high-capacity power transformers to be made smaller, lighter, and shaped to fit into any installation.

A recent example is the transformer illustrated at right. It effected a saving of 38 tons of critical materials, and fits under an existing superstructure. Shipped filled with oil, it was ready to operate immediately.

Westinghouse makes *both* core-form and shell-form transformers and applies the *correct* design for any specified application. The application of the shell-form core *where it is best applied* is a distinct contribution to service reliability and continuity. Westinghouse Electric & Manufacturing Company, Dept. 7-N, East Pittsburgh, Pa. J-97086

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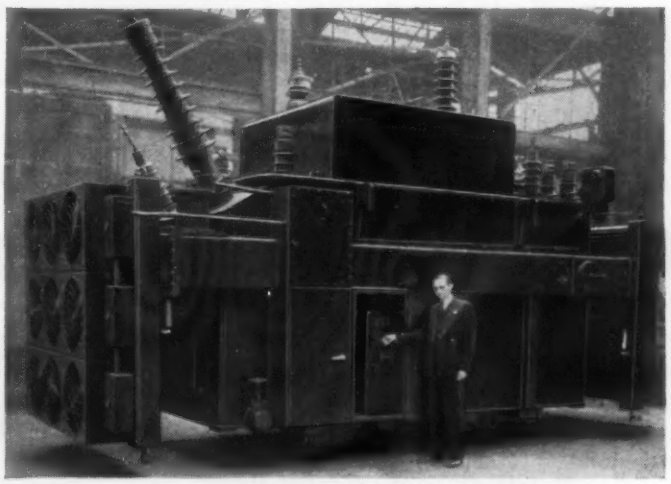
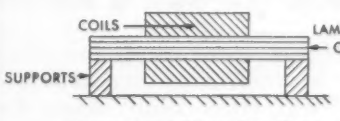


THE SHELL-FORM CORE MADE THIS TRANSFORMER POSSIBLE!

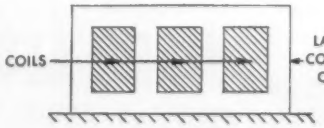
J. K. Hodnette, Manager of the Westinghouse Transformer Engineering Department, beside the 40,000 kv-a, 138 kv horizontally-mounted transformer built for a Midwestern power company.

The horizontal shell-form transformer, an exclusive Westinghouse development, ideally met the stringent requirements of this application. Diagrams below, show the basic advantages of the shell-form core.



Conventional "Core-Form" Core

Coils wrap *around* the *core.* Horizontal mounting is impractical.



Shell-Form Core

Core wraps *around* the *coils* like a steel "straight jacket". Coils are firmly anchored against movement during extra-heavy current surges. Mounted vertically or horizontally with equal effectiveness. Furnished by Westinghouse for heavy-duty high-voltage power transformers.

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Almost any kind of varnish will probably work — for a while. But, for the best service from your equipment, you need a varnish formulated to EXACTLY fit the operating conditions of your product. There's a Pedigree electrical insulating varnish that will give you longer, more dependable service in the field at lower cost.

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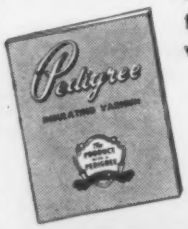

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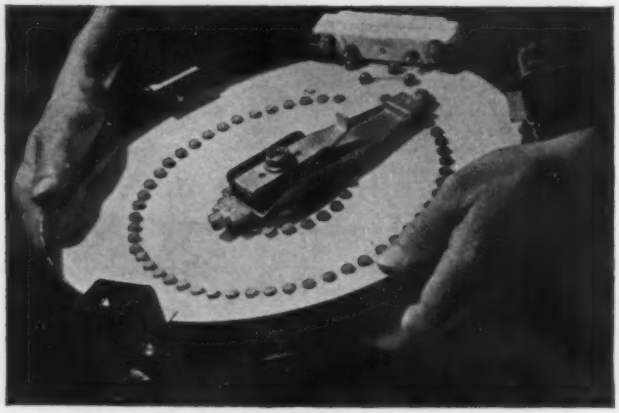

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Ward Leonard Pressed Steel Rheostats, properly installed and used, will outlast the machines they control. They are absolutely smooth in operation. They dissipate heat from both sides. Contacts are solid metal ground for perfect fit. These are but a few of their many advantages. Bulletin 60 gives full particulars. Send for a copy.

Pressed Steel Rheostats are made in 4" to 18", Ring types from 1½" to 4" inclusive.

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RELAYS • RESISTORS • RHEOSTATS
Electric control (WL) *devices since 1892.*

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BC ELECTRIC MAY TAKE COULEE DAM POWER

Purchase of Coulee Dam power by the B. C. Electric Railway Co. has been proposed for immediate consideration.

Meanwhile a joint commission, appointed to look into power questions on the Columbia River with a view to enlarging the holding basin behind Coulee Dam, probably will require from three to five years to complete its study.

Amount of power which B. C. Electric would require has not been announced, but unusually dry weather in the lower mainland section of British Columbia has lowered storage at both Vancouver and Victoria. All existing steam plants are said to be working to capacity and machinery cannot be secured for new installations.

It is recalled that some years ago, B. C. Electric lent power to Bellingham, Wash. and vicinity.

As the B. C. purchase proposal is made, the City of Seattle is preparing to flood a section of British Columbia land near Hope in connection with its Skagit development. Proposed development above Ross Dam will back up the Skagit so that it will flood a district extending four miles into British Columbia to the foot of the Hope Mountain range. Permission to flood this section has been secured.

Contract Gives Rail Rights Along Coulee Reservoir

With the granting to Great Northern Railway Co. of a lease to construct and operate a short spur track on government owned land near Kettle Falls, 100 miles above Grand Coulee Dam, the Bureau of Reclamation has cleared the way for linking water transportation on the 151-mile reservoir behind the dam with rail transportation.

The contract was negotiated jointly by the bureau and the National Park Service, which handles applications for permits to use the reservoir and adjacent lands. The proposed track would connect the railway's Republic line with water carrier service to be provided by the Lafferty Transportation Co. of Coeur d'Alene, Idaho.

● A PAY INCREASE of five cents an hour was granted San Diego Gas & Electric Co. common laborers recently by the Tenth Regional War Labor Board, raising their wages to the stabilized rate of 80 cents an hour previously ordered by the board for common laborers of the San Diego Electric Railway Co. At the same time, a petition of 760 employees of the company for a general eight per cent increase was denied.

Disposal of Government War *Plants and* Equipment

In the last four years, the Federal Government has spent over fifteen billion dollars on war plants—two-and-one-half times as much as was spent by private investors.

Of this fifteen-billion-dollar government investment, about one-third has gone into facilities for the manufacture of aircraft and for ship construction and repair; another third has gone into plants for production of combat ordnance; and the remaining third has gone into a variety of facilities for making synthetic rubber, metal products, machinery, and miscellaneous equipment.

Most of these plants are in industries that are expanded far beyond peacetime requirements. Furthermore, their convertibility to other civilian uses will, in many cases, be complicated by their specialized equipment and layout, by their tremendous size, and by their uneconomic location. At the moment, it looks as if roughly one-third of the government-owned plants and equipment can be converted fairly readily to peacetime operation, and will, therefore, be easily disposable to private enterprise.

The discovery of unsuspected uses for war plants and equipment may well raise the disposable proportion to one-half or more. The government, at the end of the war, may own about one-eighth of the commercially-usable industrial capacity of the country. It will be by far the largest owner of machine tools; it will own enormous aluminum capacity, magnesium capacity, many miles of pipe lines, and more ships than the entire private shipping industry.

What the government does with its war plants will have a profound effect on the free enterprise system and on all workers, employers, investors, and consumers who have a part in that system. If this problem is handled badly, we may find ourselves enmeshed in a trend toward monopoly and government operation of industry. If the problem is handled well, we shall have taken a big step toward freedom of action in a competitive society, toward full opportunities for business enterprise, toward well-paid productive jobs for workers, and toward a higher standard of living for us all.

Recently, three important events have signalled encouragement. They are the report of Senator George's Committee, the Baruch report, and the report of Senator Truman's Committee. These reports are noteworthy for their competent sizing up of a complex problem, for their recognition of the major responsibility of government in making a successful transition to peace, for their insistence on wise policy and good administration, and for their genuine concern that our productive powers be given full opportunity in a free private enterprise system. These reports agree on basic principles and many specific lines of action. There are, however, important areas of policy formation, organization, and procedure—especially in regard to plant disposal—which remain to be blue-printed.

In formulating the policies and practices to be followed in dealing with government war plants, our major goal must, of course, be a high level of production and employment in private business after the war.

Government operation in competition with private employers and privately-employed workers will not be desirable because it will make investment unattractive to private capital and will limit opportunities for private employment. On the other hand, sales to private buyers which result in increasing the concentration of industry will also be undesirable. We must use this opportunity to strengthen the competitive enterprise system and to move away from, not toward, the concentration of economic power in either public or private agencies.

To accomplish these objectives, a program of action such as follows will be necessary:

1. An adequate reconversion organization will be needed in the government, but its powers and responsibilities should carefully be defined by Congress. Fortunately, an able Administrator of Surplus War Property already has been appointed. It will be essential for him to work in closest cooperation with Congress and with the Armed Forces and other executive agencies. The Office of War Mobilization, and ultimately the President, must be responsible for seeing that the Surplus War Property Administration is not sidetracked by the operating agencies and is not dominated by their sheer size. Funds must be supplied generously to the Surplus War Property Administrator, so that he can set up an organization adequate to cope with this huge and complex job. Business, too, must be generous in loaning top-flight executives for postwar government service.

2. One of the first acts of the Surplus War Property Administration will have to be to assemble a complete inventory of government war plants and equipment, to make possible the planning and control of the disposal process, and to form the basis of catalogues of property available for sale.

3. Cooperation between the executive and legislative branches of the government will be needed to develop at least tentative plans with respect to matters of public policy which are of special importance to a successful transition to peace. Among these matters are the size of the military establishment to be maintained in time of peace, the stand-by facilities and reserves of materiél necessary for our security in case of future war, and our policy regarding import and production of synthetic rubber and other critical and strategic materials.

4. The Surplus War Property Administrator should

obtain from the Armed Forces, acting under congressional directives, specification of those plants which are needed to supply our peacetime Army and Navy and to provide the essential reserve capacity in case of war.

5. The Surplus War Property Administrator should select certain war plants as depots in which to store the huge surpluses of inventories and equipment which will have to be removed from private and government-owned factories in order to make possible their conversion to civilian use.

6. Those plants which are not desired by the Army or the Navy, which are not needed for storage, and which clearly will be unsuitable for peacetime utilization should be scheduled for dismantling and disposal piecemeal.

7. The two or three billion dollars' worth of government facilities intermingled with private plant should receive attention with a view to early sale, temporary continuance or use under lease, or early removal.

8. The various plants and pieces of equipment available for sale to private business should be classified conveniently, catalogued, and advertised to prospective buyers or lessors. Before the Surplus War Property Administrator offers, for private sale, plants and equipment not desired by the Army or the Navy, he should ascertain whether the plants or equipment are desired by other branches of the government or by public corporations such as the T.V.A.

9. Whenever property can be sold at prices approximating depreciated reproduction cost, that will be by far the best solution. Generous time-payment terms should be offered. In many cases the government may be unable to sell the property for reproduction cost less depreciation, for the simple reason that no one would think of reproducing it. The property may already be partly obsolete or, because of its size, location, or other characteristics, may only be moderately well suited for commercial use. This should not prevent the government from selling it, provided a price which fairly represents the worth of the property can be obtained. The best test of that worth is the price produced by active bidding under favorable market conditions.

10. When property cannot be sold at a fair price, temporary leases with options to buy should be employed to get the facilities into productive use. This should not, however, be done on terms which would cause unfair competition or create clearly excessive capacity in an industry. And the lease must be temporary; it must not be the means to prolong government control or ownership.

11. The government should offer the strongest possible resistance to local groups or industry groups seeking subsidies for continued operation of war properties. Subsidies will burden the Treasury and lead to inefficient use of resources. They will be justified only to maintain facilities needed for national security.

12. The plants and equipment offered for sale and lease should include sufficient quantities in small enough lots to satisfy the demands from small business. The war has tended to concentrate production in larger plants. After the war, we should seek a wider distribution of the government war facilities.

13. Insofar as possible, war buildings and equipment should be offered for sale in units which can be purchased by businesses in peacetime industries. Many of these industries have had to get along during the war without adequate replacement and expansion, and will be ready to buy if they are able to get what they want from the government. This is a particularly desirable market for surplus government property since these industries are, for the most part, not faced with the problems of excess capacity.

14. Property, such as machinery and other movable equipment, which is in excess of our domestic requirements or is more urgently needed by other countries, should be exported. We shall need, and can take, large supplies of raw materials in return.

15. Property which is not needed by the Armed Forces, which cannot be sold or leased on terms which would be fair to competing plants, which cannot be dismantled and distributed piecemeal, and which cannot be sold abroad, should be scrapped as soon as its non-disposability is apparent. The disposal of war plants should be completed within three to five years.

16. All negotiations for sale or disposal should be matters of open public record. As Mr. Baruch has said, the process must be conducted in a goldfish bowl. This is as much for the protection of business as for the protection of the government.

These courses of action do not include everything that must be done, but they do indicate the general lines along which our surplus war plant disposal must proceed if it is to avoid precipitating needless transition unemployment.

The gravest danger of all will be red tape, intergovernmental conflict, and inadequate administration. It would be a great misfortune for the executive and legislative branches to quarrel over details of organization when they agree on the basic principles to be followed in handling the problem. Obviously, the Surplus War Property Administration must cooperate with Congress and look to it for policy guidance. Just as obviously, the disposal problem will involve great difficulties of administration which must not be complicated by congressional interference. We shall need the best we can get in careful policy making, detailed planning, good organization, and courageous action. This is a matter of vital importance to every American. The stakes are too high to tolerate poor administration or petty politics.

James H. McGraw, Jr.

President, McGraw-Hill Publishing Company, Inc.

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Something else has got to precede them all! Electrical wiring—better wiring—adequate wiring. Without it no home or plant or business can begin to utilize all the coming electrical possibilities. And now is the time to plan for it—in advance.

Wiring has to come first—then why not put it in the forefront of your postwar thinking? Talk to the power engineer of your local utility, your electrical contractor, and get their ideas.

Remember . . . *unwired* planning will cost you a whole lot more than *planned wiring!*

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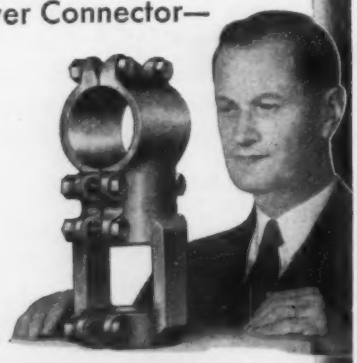
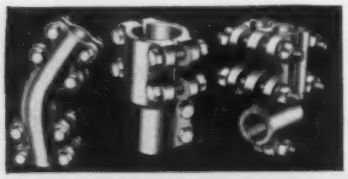


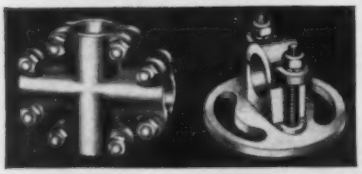
—see the COMPLETE line"

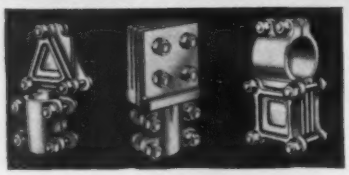
Probably the exact Power Connector you want is shown in the Penn-Union Catalog.

You will find Tee, Stud and End Connectors, Bus Supports, Terminals, Elbow and Cross Connectors, Couplers and Reducers—

—each in a wide range of sizes, up to the largest. Here are a few of the many types:







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APRIL BLIZZARD PLAGUES COLORADO UTILITIES

While a blizzard of epic proportions last month blanketed Colorado, marooning motorists atop 11,000-ft. Berthoud Pass, burying a State Highway department snowplow under a snowslide, and causing brief interruption of telephone service in Denver, Public Service Co. of Colorado's "sky line patrol," operating at 14,000-ft. altitude, kept transmission lines sufficiently free of their icy burden to insure continuous service in the affected regions.

Southern Colorado Power Co. experienced in its territory one of the worst snow and ice storms in history. In one area, where crusted ice in the primary circuit near the company's plant weighed five pounds to the foot, lines broke, putting nearly all activities in the downtown district of Pueblo out of commission; on main highways, wires sagged so low that automobiles could not pass. In another sector of Southern Colorado's territory, 50 poles were down.

Western Colorado Power Co., which services isolated mining camps in the lofty San Juan mountains, is indebted to heroic line crews for quick repairs after slides roared over cliffs and into basins, crumpling steel structures like toothpicks, crashing through power lines in twelve different inaccessible sections, damming a river and silencing a hydroelectric generating system.

During all the excitement in electrical circles, a goat managed to get herself marooned on a rocky ledge on Bellvue mountain above Idaho Springs. The animal's bleats were heard for several days before she could be located; then three Public Service of Colorado linemen scaled the heights with ropes, straps and other equipment; lowered a 14-year-old boy who harnessed the goat to the rope's end and accompanied her to safety. No power interruption was threatened. Humanitarian motives provided the sole inspiration for the rescue and brought commendation from Colorado's State Bureau of Child and Animal Protection.

Meantime Silverton, Colo., sat snug. Though there was fuel shortage and residents were unable to buck the drifts in search of wood, the community was so saturated with electric cooking ranges that nobody suffered for lack of prepared food—and the electric ovens supplied heat in homes where freezing temperatures would otherwise have prevailed.

● E. R. HOFFMAN, superintendent, Seattle City Light, has asked approval of city council for purchase of three electric locomotives for use on Skagit River Railway to haul materials for construction of the second step of Ross Dam, at a cost of about $20,000. Hoffman also has asked the council to approve expenditure of $15,000 to acquire additional direct-current generating equipment needed by City Light, resulting from the heavy increase in the electric load requirements of the Seattle Transit system.

Washington Court Rules on Condemnation Proceedings

In a five-four decision, the Supreme Court at Olympia recently handed down a three-point ruling on two appeals and a cross-appeal growing out of successful condemnation proceedings brought by the Public Utility Districts of Douglas and Okanogan counties against the Washington Water Power Co.

The court held that earnings of the company upon its properties in the two counties must be offset against interest due the company between date of verdicts, setting compensation for condemned properties and the date of actual payment of awards. The court also held that the company was entitled to compensation for necessary improvements made upon the properties between the same two dates.

Judgment on the power company's appeal, directed at the Okanogan County case and presenting error upon the denial of challenges to four jurors on the ground of implied bias, was affirmed.

Proceedings in both counties had been consolidated for trial by Okanogan Superior Court Judge Ralph O. Olson and both were consolidated on appeal.

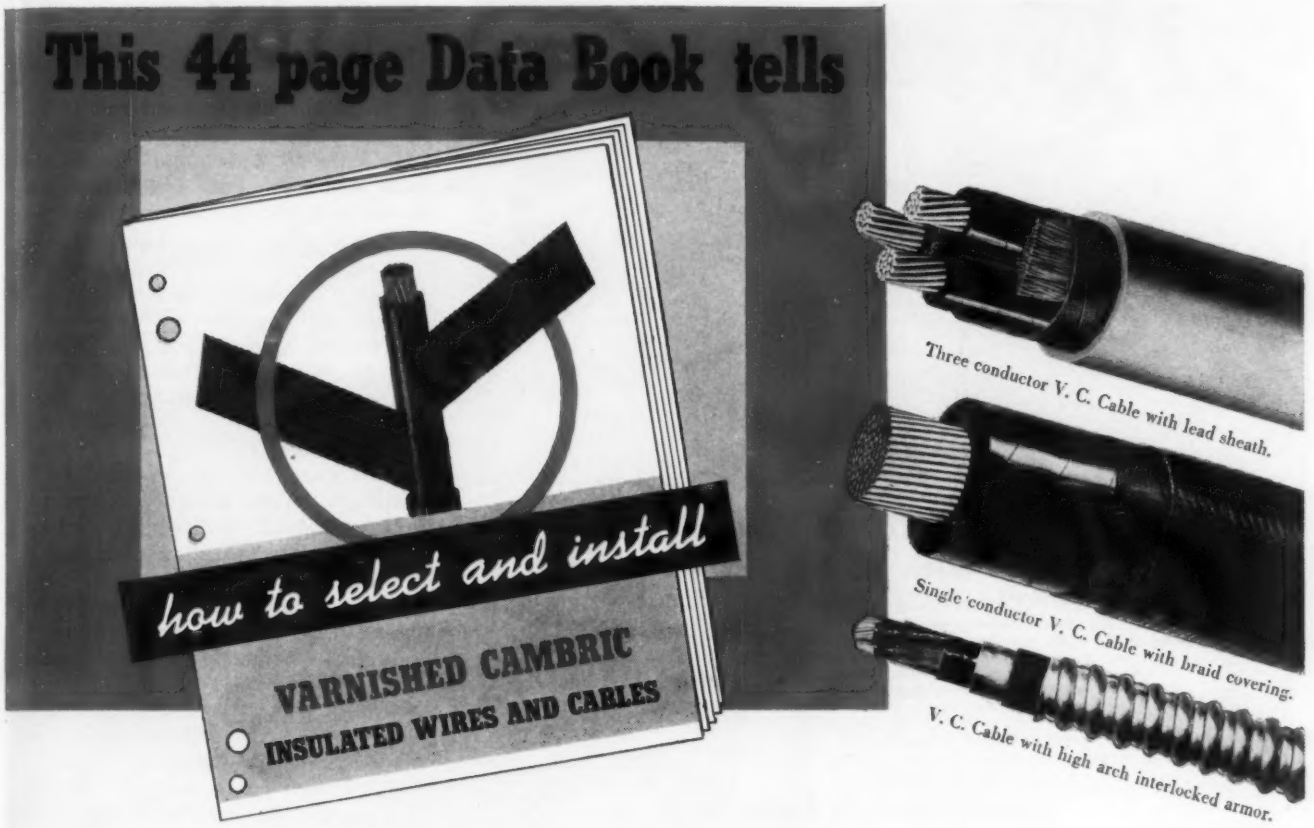
Awards made by trial court juries were $2,227,531 for company properties in Okanogan County, and $139,165 for Douglas County properties.

Utility, Steel Company Will Exchange Power

Under an exchange contract approved by the Utah Public Service Commission, Utah Power & Light and Geneva Steel Co. will give each other stand-by power service at a rate of 5 mills per kilowatt up to 10,000 kw.

The contract also provides that the utility can buy any excess power that Geneva Steel is willing to sell at rates to be determined at the time.

According to Donald Hacking, commission chairman, the contract will enable the steel company to utilize its gas by-product in production of electric energy and the power company to conserve its coal stock piles.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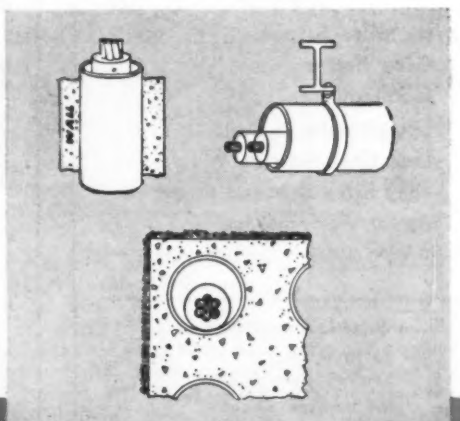
Many illustrations like these accompany the tables showing current carrying capacities of Varnished Cambric Cables in ducts, underground, and in the air, and help the engineer to quickly visualize conditions which he will encounter.



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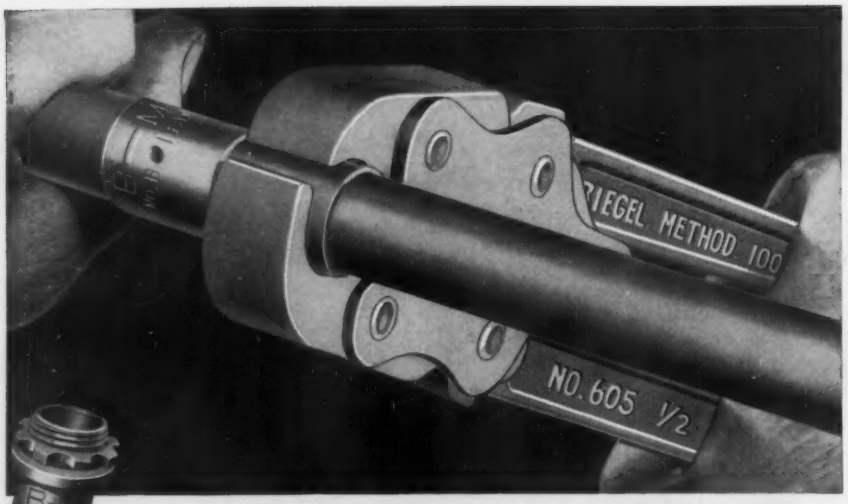

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WAGE INCREASES SAID TO VIOLATE RULES

Wage dispute between the City of Los Angeles and employees of the Department of Water and Power came into the news again last month when water and power commissioners were informed that, in making wage increases, they had violated a series of city and federal regulations.

Two $5 increases were made to all employees earning less than $350 a month during and following a strike of AFL electrical workers last February. A five-man committee of wage experts employed to survey the department's wage structure reported the violations, which included infractions against the city charter, a board rule, the federal stabilization program and NWLB rulings.

Pointing out that grave liability may be resting on board members for continuing to spend public money on the questioned wages, Board President James B. Agnew moved to rescind the increases but the motion was not seconded and the wages stand pending legal department inquiry.

Pressure put on the board by the union was blamed for the situation by Agnew, who claimed that an attempt had been made to use department employees as "pawns." The investigating committee, headed by Dr. Vernon D. Keeler, onetime law professor and federal wage authority, declared the department wages almost 15% above the Little Steel formula.

AFL Walkout Forces Utility To Surrender Contract

A two-day walkout of 1,000 AFL workers on construction of a high octane refinery at Torrance, near Los Angeles, Calif., ended April 13 when Southern California Edison Co. agreed to give up contract for its part of the job to a union firm,

The walkout came when a crew of non-union Edison Co. linemen entered the property, where Lummus Co. of New York is constructing the refinery for General Petroleum, to connect several high-voltage transformers. Members of the International Brotherhood of Electrical Workers demanded, under a closed shop agreement with the Lummus Co., that union men be supplied for the job. However, the Edison Co. men remained on the job, precipitating the walkout of the Electrical Workers and 15 other AFL unions.

Following a conference called by the Petroleum Administration for War, Edison Co. gave up its contract to the union firm of Stone and Webster.

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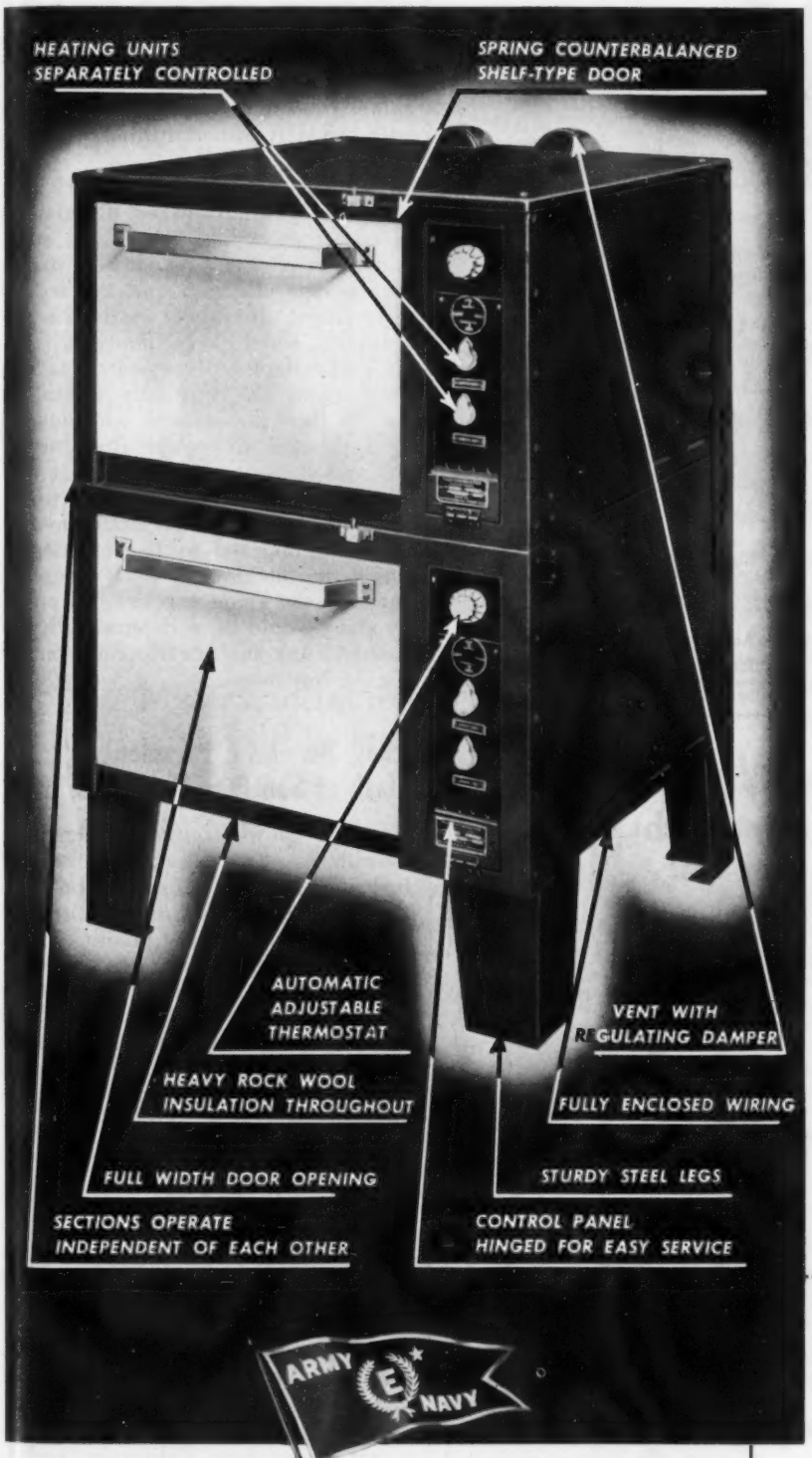

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BRICKER TELLS STAND ON FEDERAL POWER

Belief that the interest of the federal government in the distribution of electrical energy should stop at the dams it has built was expressed by John W. Bricker, governor of Ohio and candidate for the Republican presidential nomination, speaking at Tacoma, Wash.

"I most emphatically am opposed to the federal government entering into competition or fostering competition with privately owned utilities," he continued.

Whether the people want privately owned or publicly owned distribution of power should be left to the states and their subdivisions. It is a matter of self determination and the federal government, in other words the bureaucrats, should keep hands off.

"The evil of federal control is that the bureaus are constantly seeking to enlarge their powers and, with government control of power distribution, you can be sure there will be a constant effort by the bureaucrats to expand this control in all directions.

"I am opposed to the manner in which the bureaucrats have arrogated power in the Tennessee Valley Authority and I would be as determinedly opposed to any such development in the Pacific Northwest."

Ickes, PG and E President Clash at San Francisco

Verbal blows were exchanged by Interior Secretary Harold L. Ickes and James B. Black, Pacific Gas and Electric Co. president, during the former's San Francisco visit last month.

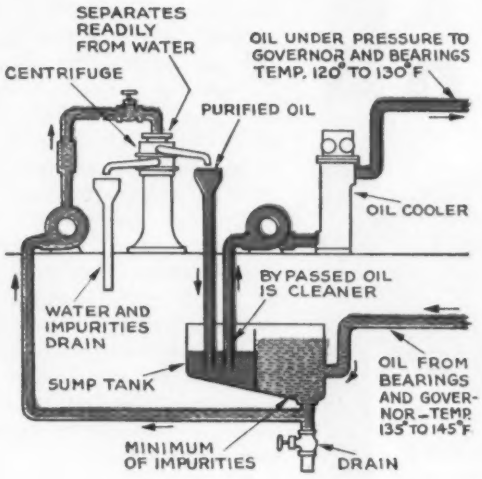
Speaking before the city's Commonwealth Club, Ickes charged the utility with endeavoring to "deny Shasta Dam power to any consumer except the PG and E by defeating the effort of my department to obtain funds to build a vital link (the Shasta-Oroville line) in transmission lines needed to carry that power to the people who own it."

Black, following the meeting, accused Ickes of a campaign to "socialize the power industry". He stated: "It is regrettable that he (Ickes) does not even have the facts in connection with the contract recently entered into between his own bureau and this company for the marketing of the output of the Shasta plant.

"There is no unserved market for power in northern California, and to build duplicating transmission lines, substations and equipment, as he made every effort to do, was found by the Congress and the war authorities to be most wasteful of vital materials, manufacturing capacity and manpower. . . ."

STANDARD ENGINEERS NOTEBOOK

VOL. 1-E NO. 2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MED.	Calol Roller Oil X
LOW	Calol Journal Oil 135
	CHAINS ENCLOSED
HIGH	Calol Journal Oil 165
MED.	Calol Journal Oil 135
LOW	Calol Journal Oil 35

SILENT CHAINS

TEMP.	CHAINS EXPOSED	
	WORN	NEW
HIGH	Calol Roller Oil X	Calol Jrnl. Oil 135
MED.	Calol Jrnl. Oil 135	Calol Jrnl. Oil 35
LOW	Calol Jrnl. Oil 35	Calol Jrnl. Oil 25
	CHAINS ENCASED	
	OIL BATH	SPLASH
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MED.	Calol Jrnl. Oil 35	Calol Jrnl. Oil 25
LOW	Calol Jrnl. Oil 25	Calol Jrnl. Oil 14

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OREGON COURT RULES ON SAFETY PROGRAM FUNDS

Certain particulars of the Oregon state legislative act attempting to levy contributions on employers for maintenance of a safety program for workers were declared invalid by Circuit Judge George R. Duncan of Marion County on April 18. The suit had been filed by the M & M Woodworking Co. and the Electric Steel Foundry Co. against the State Industrial Accident Commission and the attorney general.

Particular reference was made by the judge to the 1943 amendment to the code, requiring one employer to be assessed for a safety fund but exempting another engaged in the same occupation because the latter contributes to the Workmen's Compensatition Fund. "This does not seem to be a proper classification," Judge Duncan declared, "and the fact that such exempt employer may be so assessed under some other statute fails to remedy the defect, since the act under consideration must supply its own construction."

Utility Starts Employee Information Campaign

An effort will be made to inform several hundred new employees of the Washington Water Power Co. regarding the company's policies, background and responsibility to give good service, according to J. E. E. Royer, vice-president and general manager. The effort will also serve to remind old employees of the same good business practices, he said.

Royer explained that the company has lost 243 of its old personnel to the armed services and many more to war industries. "Our ranks have been filled with new recruits, and many questions are asked daily which indicate that information about the company is needed."

A booklet, entitled, *Know Your Company* is being prepared and a series of "Employee Forum" meetings is underway, as steps in the information program.

● THE CALIFORNIA HYDRAULIC ASSN. will meet in Oroville May 14 with the Oroville Chamber of Commerce and inspect proposed federal dam sites in the Feather river canyon, it was reported last month.

● ARIZONA ELECTRIC POWER COOP. takes the place of Flagstaff Electric Light Co. in a recent change of ownership. The company also serves Winslow, Ariz.

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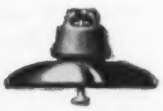

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That's the record. Westinghouse quotes it, not in self-praise, but as a guide to men responsible for porcelain performance.

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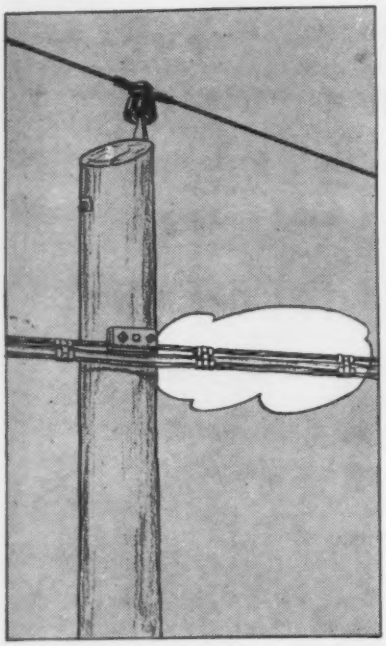

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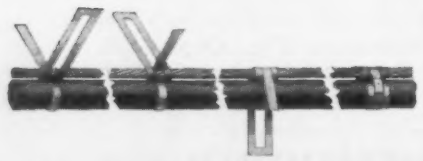

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PEOPLE
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Coast Counties Names Hayden Sales Manager

R. L. Hayden has been appointed sales manager in charge of electric and gas sales activities for the Coast Counties Gas & Electric Co. at Santa Cruz. The appointment relieves H. W. Edmund, vice-president and general manager, of the sales responsibilities, which he had carried for the past year and a half.

Succeeding to Hayden's former post of Contra Costa division manager is his brother, Clifford R. Hayden, who has been manager of the Imperial Valley district. Fred Hix becomes Imperial Valley manager, W. R. Snyder, Westside division manager and Wayne Matthews, Hollister manager as a part of the new set-up.

R. L. Hayden has been associated with Coast Counties for 14 years and previously had sales experience with major oil companies.

Falck Replaces Krug as War Utilities Chief

Edward Falck, deputy director of the Office of War Utilities since its organization early in 1943, has been named director to replace J. A. Krug by WPB Chairman Donald M. Nelson. Krug has entered active duty with the Navy, with rank of Lieutenant Commander.

A veteran of the war power program, Falck joined the old Office of Production Management in mid-1941 at the request of Krug, who made him chief of the power allocation section of OPM's Power Division. In 1942 he left the organization to become Krug's assistant as director of priorities, returning to the power program when OWU was organized. Before joining OPM, Falck had been assistant to the vice-president of New York's Consolidated Edison Company for about four years. Prior to that, he was director of research and rates for the Tennessee Valley Authority.

● PAUL F. HATCH recently was appointed acting district engineer of the Mid-Columbia district of the Bonneville Power Administration. He will handle engineering and operating problems relating to customer service from the Bonneville-Grand Coulee power system in the southeastern Washington-eastern Oregon area.

HAYDEN

Employed by Bonneville since 1939, Hatch has served as engineering draftsman, assistant and associate engineer. Previously he was employed by various Northwest private utility companies.

● A. J. SHAVER, Winnemucca, Nev., has been appointed engineer of the Colorado River Commission to fill the vacancy created by death of Charles DeArmond, it was announced recently by Nevada Governor E. P. Carville. For the past seven years Shaver has been manager of the Western States Utilities Co. in Winnemucca and was previously associated with Sierra Pacific Power Co. in Reno.

● O. F. ACHTENHAGEN, formerly general manager of the Philco training school at Philadelphia, has purchased the Radio and Appliance Distributing Co. of Denver, Philco distributor in the area. Achtenhagen will keep the company name, and occupy the same building at 1708 16th St.

● PAUL R. OLDENBERG, formerly distribution planning engineer for Duquesne Light Co., Pittsburgh, has joined Pacific Power & Light Co. at Portland as system betterment engineer. He had been with Duquesne for 20 years, serving in various capacities.

● DR. E. W. SCHILLING, dean of engineering at Montana State College, Bozeman, has been honored with the classification of "Fellow" by the American Institute of Electrical Engineers, the highest recognition given a member by the institute.

● F. W. NELSON has been named Southern California Edison district manager at Fullerton to succeed the late M. F. Rhodes. He was formerly office manager of the company's Santa Monica office.

MOVE OR ADD LIGHTS WITHOUT REWIRING—WITH UNIVERSAL Trol-E-Duct

BullDog's Universal Trol-E-Duct installation in a large midwestern machine tool plant. Note how the closely spaced fluorescent fixtures are suspended and tap current from the Trol-E-Duct runs.

4 BIG HELPS TO PRODUCTION

1 Puts Lights Where They Are Needed—Close to the Work

Universal Trol-E-Duct is a job-proven, modern refinement in factory lighting. Every inch of the duct is a potential electrical outlet which can be instantly tapped to put light close to the work. Simply move the light along the overhead duct, or plug in new lights wherever needed.

2 Always Ready for Quick Production Changes

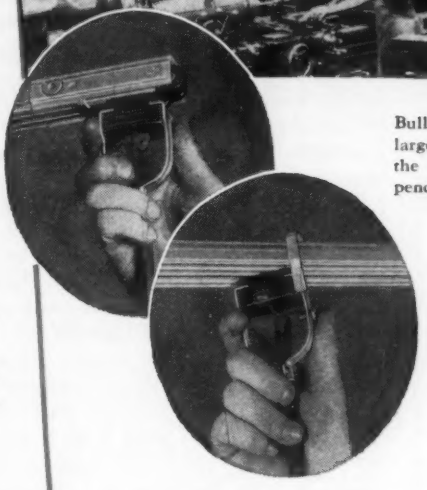
Universal Trol-E-Duct, built in standard sections, is quickly and easily installed, and can be moved as easily to another location. It is an extremely flexible system — 100% salvable — always ready for quick production changes.

3 Fits Any Production Set-Up

It can be mounted against the ceiling or suspended by messenger cable below it. It will fit the layout of any industrial plant or commercial building.

4 Accommodates Any Type of Lighting Fixture

No matter what type of lighting fixture you use — fluorescent, mercury vapor, or incandescent — Universal Trol-E-Duct can accommodate it because every unit of the system is pre-fabricated at the factory for a wide variety of lighting fixtures.



Extreme Left — Shows how simply the trolley may be inserted at the end of the duct runs. Trolley entrance couplings also make possible insertion of trolleys between sections.

Immediate Left—The Twistout Plug can be used at any point in the duct run simply by inserting it in the duct slot and giving it a 90 degree turn.

BullDog Universal Trol-E-Duct is a lighting system of assembled standard duct sections, tightly and safely enclosing copper bus bars from which trolleys and twistout plugs collect current.

Thousands of war plants, big and small, find this thoroughly modern lighting system an important factor in speeding production by bringing light close to the work.

If conditions do not permit you to change over to this easy, quick, flexible lighting system now, be sure to modernize with Universal Trol-E-Duct before the products of peace go to market again.

Buy More War Bonds — Turn in Your Scrap

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ELECTRIC PRODUCTS CO.

BOX 177, R. PK. ANNEX
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BullDog Electric Products of Canada, Ltd., Toronto, Ont.

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ALSO MANUFACTURERS OF
VACU-BREAK SAFETY SWITCHES • SAFTOFUSE PANELBOARDS • SWITCHBOARDS • CIRCUIT MASTER BREAKERS BUSTRIBUTION DUCT *for "Plugin" power* • INDUSTRIAL TROL-E-DUCT, *for movable "loads."*

BULLDOG PRODUCTS ARE SOLD AND DISTRIBUTED BY THE FOLLOWING PACIFIC COAST REPRESENTATIVES:

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Portland, Oregon, Tel. Garfield 2844

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1445 Stevenson St.
San Francisco, Calif., Tel. Hemlock 2470

Mullenbach Electrical Manufacturing Co.
2300 East 27th Street
Los Angeles, Calif., Tel. Jefferson 2224

1: Not 25 SIZES

2: Not Even 15 SIZES

3: But Only 8 SIZES

Accomodate EVERY Cable-Connector from No. 8-Solid to 1000 MCM When You Connect With:

SHELDON EV-R-ON

SOLDERLESS CABLE TERMINALS

A MUST for Utilities and Industrials
Dependable, Secure, Efficient Anchoring

Each Sheldon EV-R-ON Terminal Connector takes a wide range of cable sizes. Only EIGHT sizes of them accommodate ALL cable sizes, from No. 8 solid to 1000 MCM. Think what that means in smaller inventory and smaller investment alone—a BIG savings.

Think of the many, little-used sizes which HAVE to be carried with other terminal-connectors which do not have anything like this versatility. With EV-R-ONS, you need have only a half, a third, or a fourth the number of sizes on hand.

Send for Full Information

TRIANGLE PACIFIC CO.

C. H. Kaufman, 340 Azusa, Los Angeles, 12, California
R. E. Larsen, 1045 Bryant, San Francisco, 3, California
R. S. Sloan, 95 Connecticut, Seattle, 4, Washington

Sales Agents: We now have some excellent open territories.

Johnson Promoted to New Post With Joshua Hendy

Wallace Johnson has been appointed general sales manager of the Joshua Hendy Iron Works at Sunnyvale, Calif., according to announcement by President Charles E. Moore.

A graduate of California Institute of Technology in mechanical engineering, Johnson was associated with Moore in the Moore Machinery Co. and in the Autometric Machine Tool Co. Later he was general manager of the Production Engineering Co. of Berkeley. He joined the Hendy organization in 1942.

Also announced last month by Hendy was transfer of Clarence F. Jensky to the Washington, D. C., office as special representative on turbine design, construction and manufacturing. He had been with the organization at Sunnyvale.

Westinghouse Elevator Co. Names Skaife Coast Manager

Creation of a new position, Pacific Coast district manager, and appointment of Arthur F. Skaife to fill it was announced last month by Westinghouse Electric Elevator Co.

Another change in the Pacific Coast set-up was transfer of Gano R. Baker to Los Angeles as southern California manager. Baker formerly was application engineer at San Francisco.

Skaife, for the past 12 years manager of the San Francisco district, in his new post will consolidate all activities of the company in the Pacific Coast, Rocky Mountain and southwestern states, Alaska and Hawaii.

A Californian by birth, Skaife started in the elevator industry in 1896, when he became an apprentice mechanic for the Cahill & Hall Elevator Co. Until 1917, he held various positions with that firm and others and then joined the Spencer Elevator Co., which was acquired by Westinghouse in 1932.

● APPOINTMENT of Roy A. Wehe, a staff member of the California State Railroad Commission since 1923, to the post of assistant director of the Public Utility department, was announced recently by Richard Sachse, president of the commission.

Wehe, who has been chief of the gas and electrical division of the commission during the past eight years, henceforth will be directly responsible for all formal matters relating to rate proceedings and franchise issues. He will also direct the preparation of cases initiated by the commission and conduct hearings.

Electriquiz Answers

(See Page 81)

1. In the field of plywood and plastics, high-frequency heating will help make cheaper, stronger and more uniform products. With its use, plywood will be bonded in minutes instead of days, and plastic forms will be produced and cured in a fraction of the time now required.

2. Ultraviolet radiations, such as produced by an ultraviolet lamp, can reduce food spoilage by preventing the formation of mold and decay.

3. Radiant heat lamps might be used to supplement present heating methods, since their radiation acts like a beam of light and can be focused on a desired spot. Another possible use of this radiant energy is in quick cooking and drying and preserving foods.

4. House wiring. It has not kept pace with increased appliance use nor with the increased wattages as applied to individual units. Wiring in 95% of America's homes, studies have shown, is inadequate to carry efficiently even the present lighting and appliance loads. Corrective action is a *must* in both new and old homes.

5. No. Although they will be improved in many ways, electrical appliances put on the market immediately — or within a few months — after the war will be practically the same in outward appearance as those sold immediately before the war, because existing production facilities will be used. "Dream products" will make their appearance only after they have been thoroughly backed by research, tests and a survey of the public's desire for them. They will be products of "evolution" rather than "revolution."

6. The more convenient and comfortable postwar home will use much more electricity. Prospects are that national home consumption of power will at least double the present national average consumption in the postwar era.

7. Conservative estimates are that more than one million homes must be built annually for ten years after the war if we are to hold our own as a nation in the housing field.

8. The electrical industry.

••• DIRECTORY •••
POWER LINE EQUIPMENT

TAKE THE GUESSWORK OUT OF FUSE LINKS

The right fuse—in the right place—at the right time—when you use Kearney handy Fuse-Paks-on the pole in a Fuse Pak Pole Dispenser No. 12165.

SERVICE INTERRUPTIONS STOP WAR WORK

Nearly 95% of all maintenance work can be done safely, quickly and economically with Kearney Hi-Line Tools while lines are working.

HOLDING POWER FOR HEAVY CORNERS

The No. 8120 Kearney 2-Way Expansion Anchor provides 10,500 pounds holding power in ordinary soil. Other Kearney Anchors provide relative holding power.

RELIEVES LINEMAN STRAIN

Kearney Heavy Duty Platform, No. 4901-36, provides a safe place and a normal working position for men on pole or tower.

KEARNEY SOLDERLESS WIRE CON-NEC-TITES

Made with the same precision and refinements yesterday, today and tomorrow. It will pay you to make comparisons.

TRIPOMATICS SERVING IN RUSSIA AND INDIA

Kearney Tripomatic primary fuse cutouts have gone to war along the far-flung battle fronts of the world. You'll never know what positive distribution line protection means until you try them.

THREE-FOLD PROTECTION

Kearney Trip-Saver (Reclosing) Fuse Switches saves trips and reduces outages as much as 90%.

EACH of the products described in this directory was scientifically developed and carefully fitted to the needs of the electrical industry. Space doesn't allow more than a few words about these products, but complete Bulletins are available on each and it will pay you to have complete knowledge of their use and application.

WRITE DEPT. H

JAMES R. KEARNEY CORPORATION

4224 Clayton Ave. St. Louis, Missouri

ϟ WHAM! ϟ

Are you sure when lightning strikes your lines that your fuse switches will dissipate the stroke and cut off the power follow-up in time to save line equipment. Better try Kearney Trip-Out Fuse Switches.

WARTIME POWER LOADS

Easily carried by the heavy blades and contacts of Kearney Hook Operated Disconnect Switches.

B-24 AND B-17

Precision equipment made by Kearney flies the skies over Europe and the Pacific Southwest with many a B-24 and B-17 Bomber. Experience in this field has broadened the scope of our manufacture to the benefit of our regular products.

DID YOU KNOW?

Did you know that on Regulator installations only three (3) Kearney Regulator By-Pass Switches are needed instead of nine (9) conventional disconnects? Ask about this.

HEAVY GANG SWITCHES

The heavy rugged design of Kearney Gang Switches have proved their worth in these days of overloaded lines.

SUBSTATION INSURANCE

Use sturdy Kearney Bus Supports and Power Connectors to handle today's heavier loads. Write for Bulletin No. 316.

BETTER BE SAFE THAN SORRY

If you must interrupt service protect your linemen with Kearney ground sets installed on both sides of place where work is done.

MINIMUM MAINTENANCE

—because operating coils are replaceable in the Kearney-Martin multiple relay. A new product for multiple street lighting circuits.

IMPORTANT LIGHTNING FACTS

Lightning is diverted off the line and to ground harmlessly when Kearney Lightning Arresters are used.

ACCESSORIES — PLUS

Take advantage of the many Kearney Pole Line Accessories that make the difference between an ordinary job and an excellent one. Use Kearney Guy Wire Clips, Dead-End Clamps, Ground Wire Clips, Ground Rod Clamps and other accessories.

WARTIME CONVERSION

Don't scrap old switch mountings—you can modernize them with Kearney Trip-O-Link or Tripout Conversion assemblies.

USE TRIP-O-LINK FUSE SWITCHES

For conservation of critical materials—particularly on rural lines—choose the revolutionary Kearney Trip-O-Link Fuse Switch.

SAVE METERS

Nothing is more scarce today than instruments. You can make most load and voltage surveys with one voltmeter and one ammeter when you use the new Kearney Recorder Selector Swtich.

COORDINATION —

is important in every industry, and fuse link coordination will save you many needless trips and outages. Write for Time Current curves on Kearney Fuse Links.

Use FOR BETTER MAINTENANCE and CONSTRUCTION— KEARNEY PRODUCTS

● WITH RELAXATION of dimout lighting controls, Fred J. Wellhouse, chief of the light control section of the Office of Civilian Defense, Ninth Region, has returned to his former position as lighting specialist for Westinghouse Electric & Mfg. Co. at San Francisco. He will continue as light control consultant for the OCD.

Wellhouse has been on leave of absence for the past year. With his return, George P. Leyes, who has handled Wellhouse's work in the aviation, marine and street lighting fields, will again devote his entire time to commercial, industrial and flood lighting in the San Francisco area.

● PROMOTION OF HORACE HOLCOMB to a newly created office of vice-president in charge of industrial relations has been announced by the Baldwin Locomotive Works. Until he went east about a year ago as assistant to Baldwin's president, Holcomb was vice-president and general manager of the Pelton Water Wheel Co., San Francisco, a Baldwin subsidiary.

● W. E. LEE has been appointed marine division representative for Westinghouse in the Los Angeles area. He formerly was electrical application engineer in that area. He has been with Westinghouse since 1936.

Answer to "Who Am I?"
(See Page 82)
K. M. Ryals

● COAST ELECTRIC & MFG. CO. of Portland, manufacturers and distributors of electric equipment for the building and industrial trade, has announced appointment of C. (Neil) Sullivan as engineer. Sullivan, who will work in the Oregon and Washington territory, has been connected with the electrical industry of the Pacific Northwest for the past 16 years. He formerly was with Westinghouse and more recently has been supervising electrical engineer in the operation division of the U. S. Army Engineers, Portland District, aiding with the cantonment and airfield construction program.

● HENRY J. GILLE, member of the electrical industry for 54 years, 31 of them with Puget Sound Power & Light Co., retired on April 1. For the past 12 years he had been manager of industrial and agricultural development for Puget Sound.

A native of St. Paul, Minn., Gille began his career in 1890, with the Acme Electric Co. In 1898 he became general superintendent of the Edison Electric Light & Power Co. in St. Paul and from 1907 to 1913 was with the Minneapolis General Electric Co. He moved to the Pacific Northwest and joined Puget Sound in 1913.

● ERNEST H. FINCHER has been transferred from Seattle to San Diego by Westinghouse Electric & Mfg. Co. In his new post as engineering and service representative, Fincher will be responsible for maintenance and proper operation of the company's electrical equipment on naval and cargo vessels, aircraft and other industrial plants in the San Diego area.

When you insist on U. S. Graphite Brushes you always *RING THE BELL* with maximum power output

U. S. G. *Specialized* Brushes—composed of the best materials the market affords—eliminate power waste, motor damage and other brush troubles due to faulty design and substandard material. They are manufactured under the supervision of a highly specialized organization and in a plant that is thoroughly equipped with modern machinery and equipment.

MARWOOD WAREHOUSES carry nearly a thousand different varieties of U. S. G. industrial and f.h.p. brushes. Facilities are also on hand for making up brushes to meet special or emergency requirements.

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Exclusive Pacific Coast Agents for United States Graphite Company

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558

Obituary

● ROBERT CHAMBERLAIN, prominent figure in the electrical field in Vancouver, died at his home there recently. For the past twenty years Mr. Chamberlain had been electrical engineer at the Capitol Theatre.

He was born in England, came to Canada at the age of 17 and received his training with the Canadian General Electric in the installation of power plants in eastern Canada.

Moving to Vancouver in 1897 he was occupied in designing, installing and operating electric plants for various mining companies. He also acted as consulting electrical engineer.

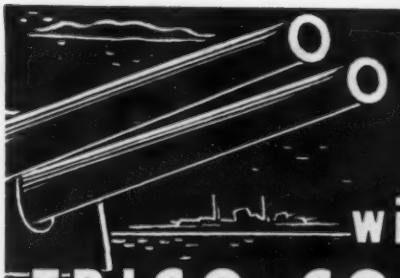
● WALTER M. GRAY, assistant to the manager of the industrial division of General Electric Co. in San Franciso, died April 3 at Highland Hospital in Oakland at the age of 45. Mr. Gray joined General Electric's San Francisco office in 1923 in the order service department and later was transferred to the industrial department.

● JOHN H. FISHER, director of the Southern California Edison Co. and Southern California industrial leader, died recently in Pasadena. Son of Henry Fisher, one of the founders of the Redlands Electric Light and Power Co., whose Mill Creek No. 1 plant was the first three-phase hydroelectric plant in the United States, Mr. Fisher was an active member of the Western electrical industry. He had been a Southern California Edison director for 34 years, and was president of electric railways which operated in past years in San Bernardino and Redlands.

● JOSEPH THIEBEN, founder and copartner in the firm of Panama Lamp & Commercial Co., San Francisco, died March 30, following a brief illness. Mr. Thieben founded the business about 47 years ago and at the time of his death was associated with Sello J. Blumenthal in its management. Active in civic affairs, Mr. Thieben was a member of a number of business and improvement clubs.

● W. D. EVANS, SR., a partner with his son, W. D. Evans, Jr., in the Salinas Electric Works, died April 2. Mr. Evans was a pioneer electrical contractor and dealer in the Salinas Valley. Before starting the business about 35 years ago, he was with the telephone company.

● M. F. RHODES, manager of the Fullerton district of the Southern California Edison Co., died in Fullerton. A veteran of almost 25 years of Edison service, he had also served as district manager at Porterville and Oxnard.



Double Barreled
PROTECTION
with this Famous
TRICO COMBINATION

Just as sleek barrels of defense guns protect American Liberty, so do TRICO "POWDER-PACKED" Renewable Fuses and KLIPLOK CLAMPS protect production schedules against unnecessary shutdowns and lost production. It's a 100% trouble-free combination.

POWDER-PACKED FUSES

The renewal element is "different." It is custom-built to give the maximum in safety, efficiency and dependability. You get THREE TIMES THE SERVICE . . . at NO ADDITIONAL COST.

KLIPLOK CLAMPS

That time-tested jack-screw and INTERNAL tapered-wedge principle literally bolts fuses and clips together without friction loss. No burnt fuses and clips—unnecessary shutdowns and wasted current caused by over-heating. There's a size for every clip. Write for Bulletin No. 6.

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Make deposits when you want to . . . right at the nearest mailbox. No need to "go to the bank." Nine out of ten transactions are routine that can be handled by our Mailway service, night or day, Sundays and holidays. Our special Mailway envelopes and passbook make service quick and safe.

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CROCKER FIRST NATIONAL BANK
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ONE MONTGOMERY STREET

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Electrical Connectors

ILSCO electrolytic copper connectors are made from pure copper strips and tubing. Weight is one-third to one-sixth of cast connectors . . . but performance is often superior to heavier and bulkier cast copper alloy connectors.

Buy conductivity . . . not weight!

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PROFILES *of the month*

Right: Bruce Shavere (left) of Lewistown, and new president Montana Chapter IAEI, is congratulated by John Crawford, Butte, retiring chairman. Shavere is an REA inspector in Montana. Crawford conducted the two day session at Great Falls, reported on page 77, and attended by a record crowd

Three Oakland contracting firms represented at a recent Sylvania dinner in San Francisco are pictured below. From left are Edgar Chloupec, California Electric Co.; Walter Vance, Jr., Pacific Electric Motor Co. and Lou Spott, Spott Electric Co., East Bay chairman, of the Electrical Contractors Assn.

At San Francisco on his tour of the West, R. M. Swetland (center) G-E illuminating engineer, explains recent improvements in street lighting distribution equipment to Romaine M. Myers (left) Oakland and Karl M. Koch, San Francisco

ON THE LINE APRIL 29

PIT 5 POWERHOUSE

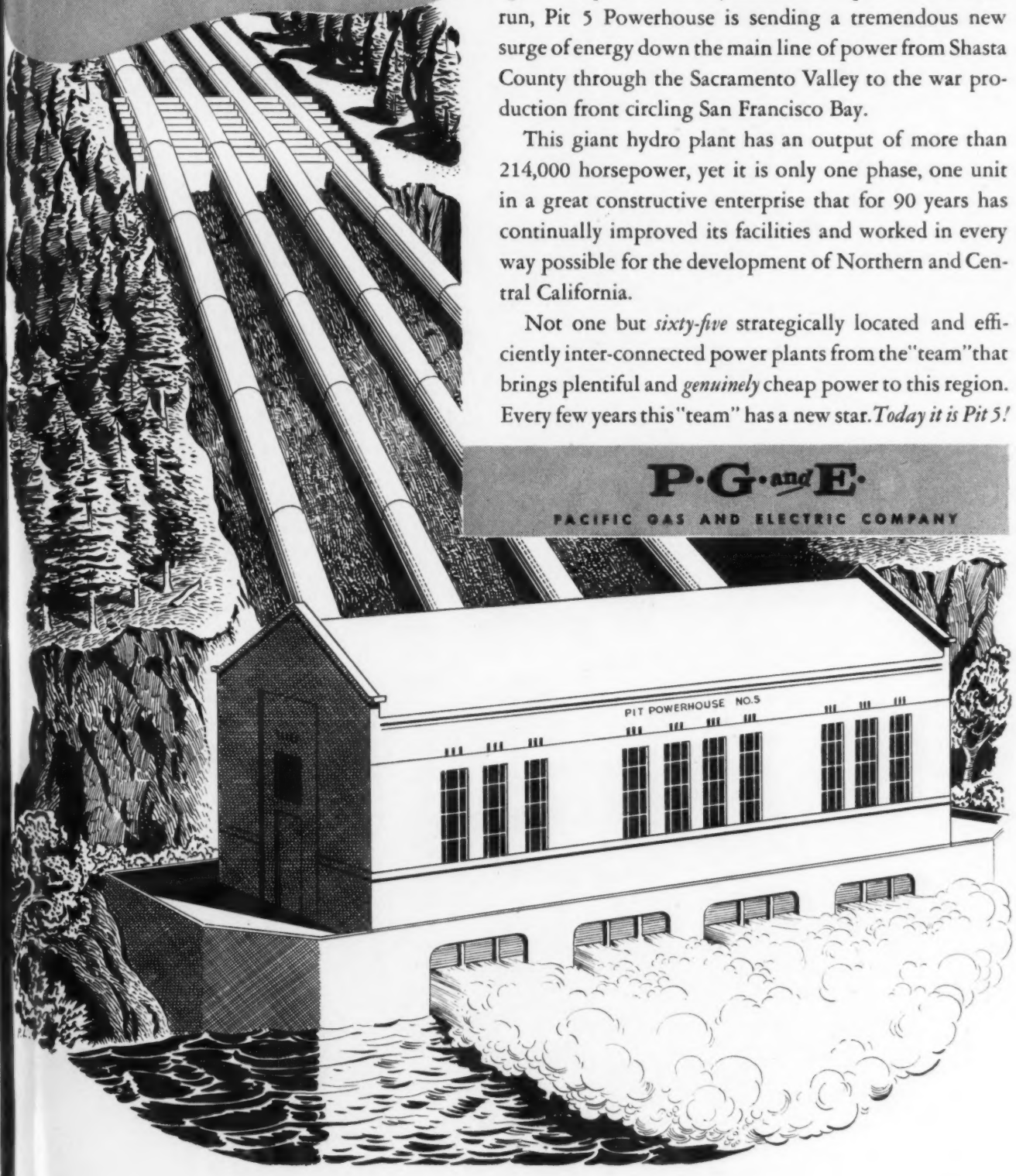
Spic and span as a newly launched ship on her maiden run, Pit 5 Powerhouse is sending a tremendous new surge of energy down the main line of power from Shasta County through the Sacramento Valley to the war production front circling San Francisco Bay.

This giant hydro plant has an output of more than 214,000 horsepower, yet it is only one phase, one unit in a great constructive enterprise that for 90 years has continually improved its facilities and worked in every way possible for the development of Northern and Central California.

Not one but *sixty-five* strategically located and efficiently inter-connected power plants from the "team" that brings plentiful and *genuinely* cheap power to this region. Every few years this "team" has a new star. *Today it is Pit 5!*

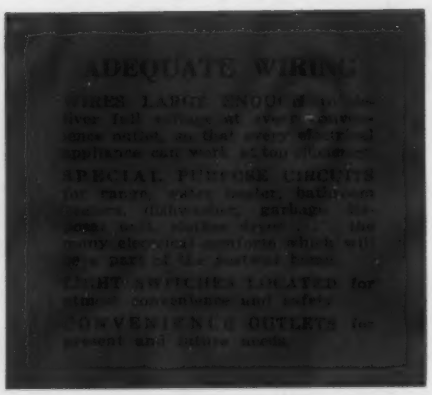
P·G·and E·

PACIFIC GAS AND ELECTRIC COMPANY



** The long neck of the giraffe is designed for the job—it enables him to reach the leaves of the trees upon which he feeds.*

There is no substitute for adequate electric wiring in the home. Adequate wiring is designed for the important job of making possible the full enjoyment of every modern electrical comfort and convenience. It is essential to the full use of electrical appliances and other time and work-saving services performed by electricity. It provides for present and future needs. . . . Now is the time to prepare yourself so that you will be able to advise home-planners concerning the wiring needs in their postwar homes.



Conservation of electricity will help win the war

PACIFIC COAST ELECTRICAL ASSOCIATION

601 W. FIFTH STREET, LOS ANGELES 13, CALIFORNIA